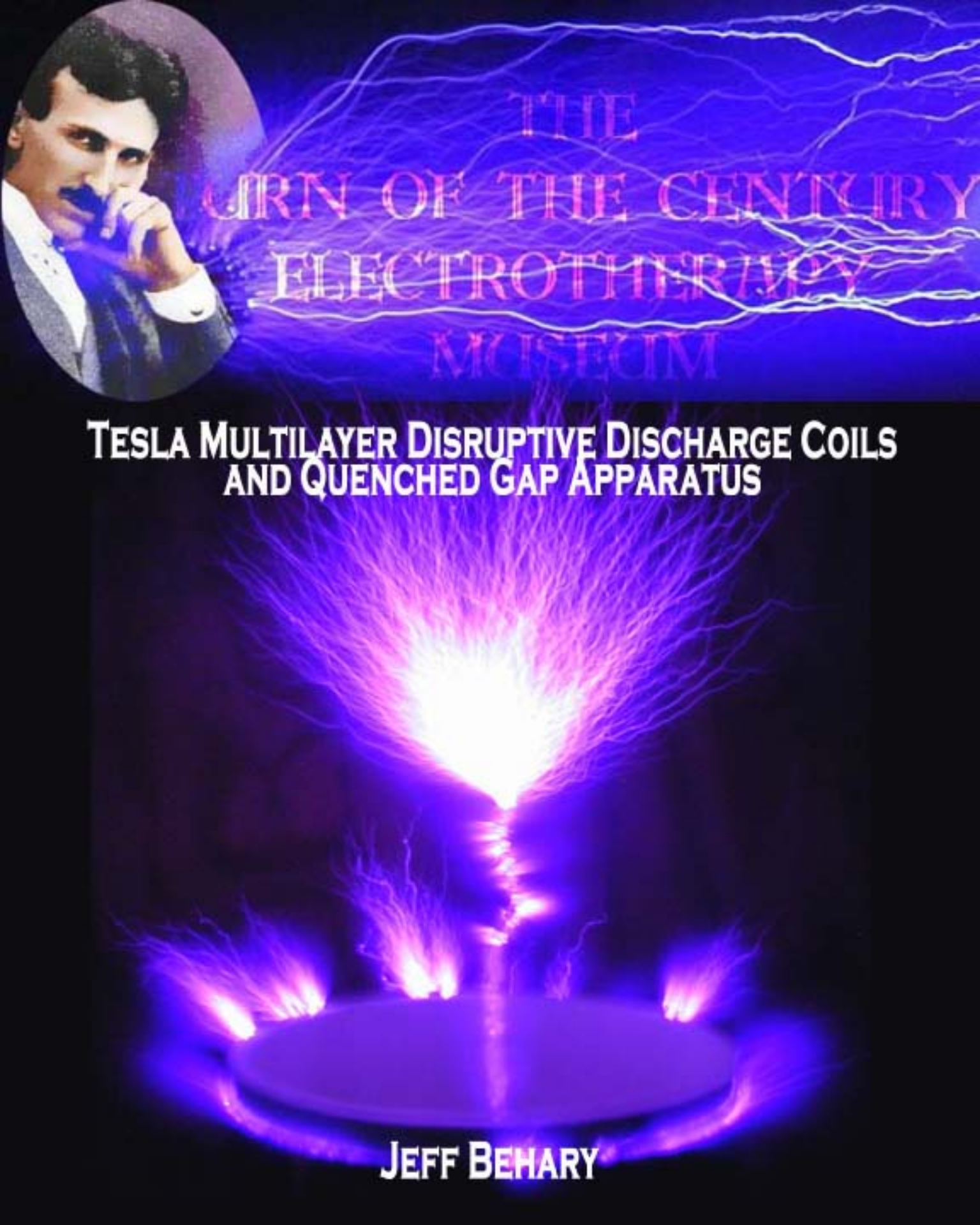
THE TURN OF THE CENTURY ELECTROTHERAPY MUSEUM

TESLA MULTILAYER DISRUPTIVE DISCHARGE COILS AND QUENCHED GAP APPARATUS



JEFF BEHARY

The Turn Of The Century Electrotherapy Museum
http://www.electrotherapymuseum.com

Jeff Behary
2809 NE 15th Street
Pompano Beach, FL 33062 U.S.A.

All photos are from the private collection of
Jeff Behary. This includes original machines and texts.

Recommended original texts:

Medical Electricity, Rõntgen Rays, and Radium - Dr. Sinclair Tousey
High Frequency Currents - Frederick Finch Strong
A Working Manual Of High Frequency Currents - Noble M. Eberhart
High Frequency Apparatus - Thomas Stanley Curtis

The Turn Of The Century Electrotherapy Museum offers modern reprints of the above rare texts, and many others. Contact the author for more details.

None of the apparatus in this book should be used for medical purposes. While at one time many of them were used quite authentically for such purposes, many of which can cause serious bodily harm in untrained hands, even death.

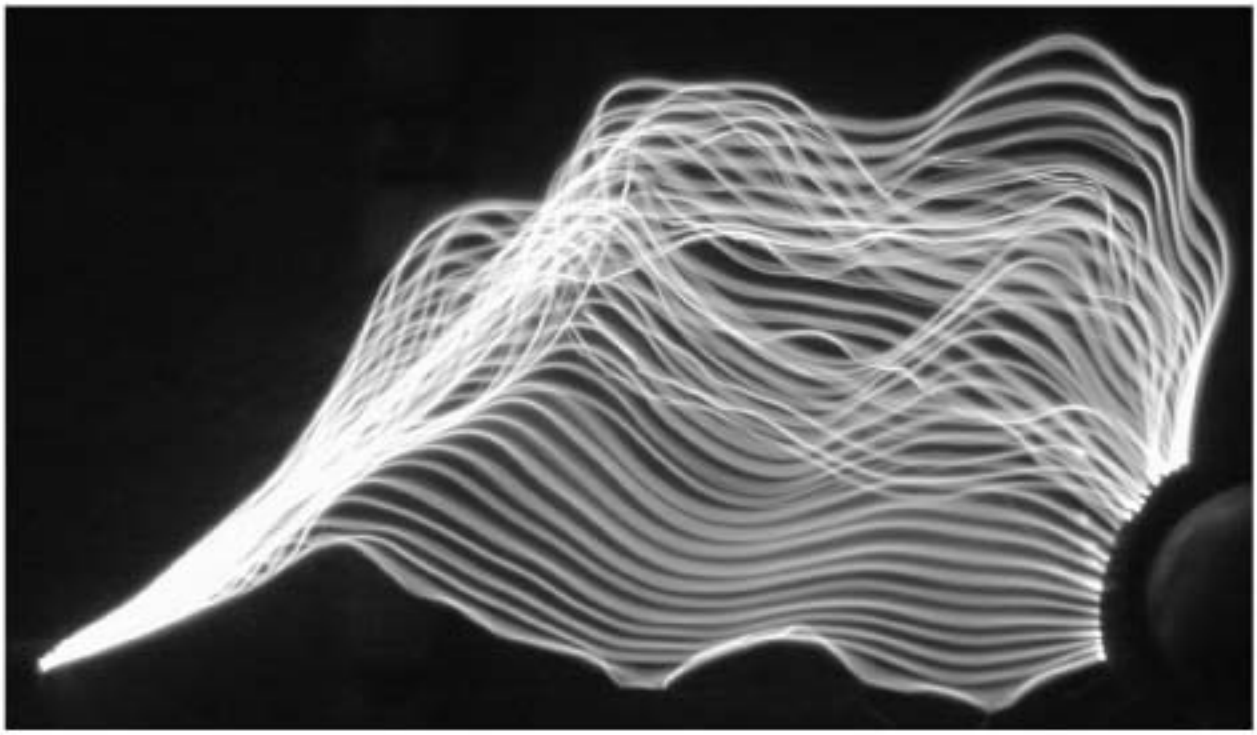
The information in this book is given for reference only. The author accepts no responsibility for the harm of any persons associated with the use of these devices. Tesla Coils and High Voltage apparatus are lethal pieces of equipment, and by no means should they be built or repaired by people without extensive electrical knowledge in these specific fields.

The author's researches are for the education of the public concerning the inventions of Nikola Tesla. The author gives no medical claims to any apparatus in this book, nor does he endorse any fringe science claims for 'free energy' devices, Rife Machines, etc.

None of the photos in this book have been modified in any way, other than cropping or converting color to black and white. There is NO trick photography.

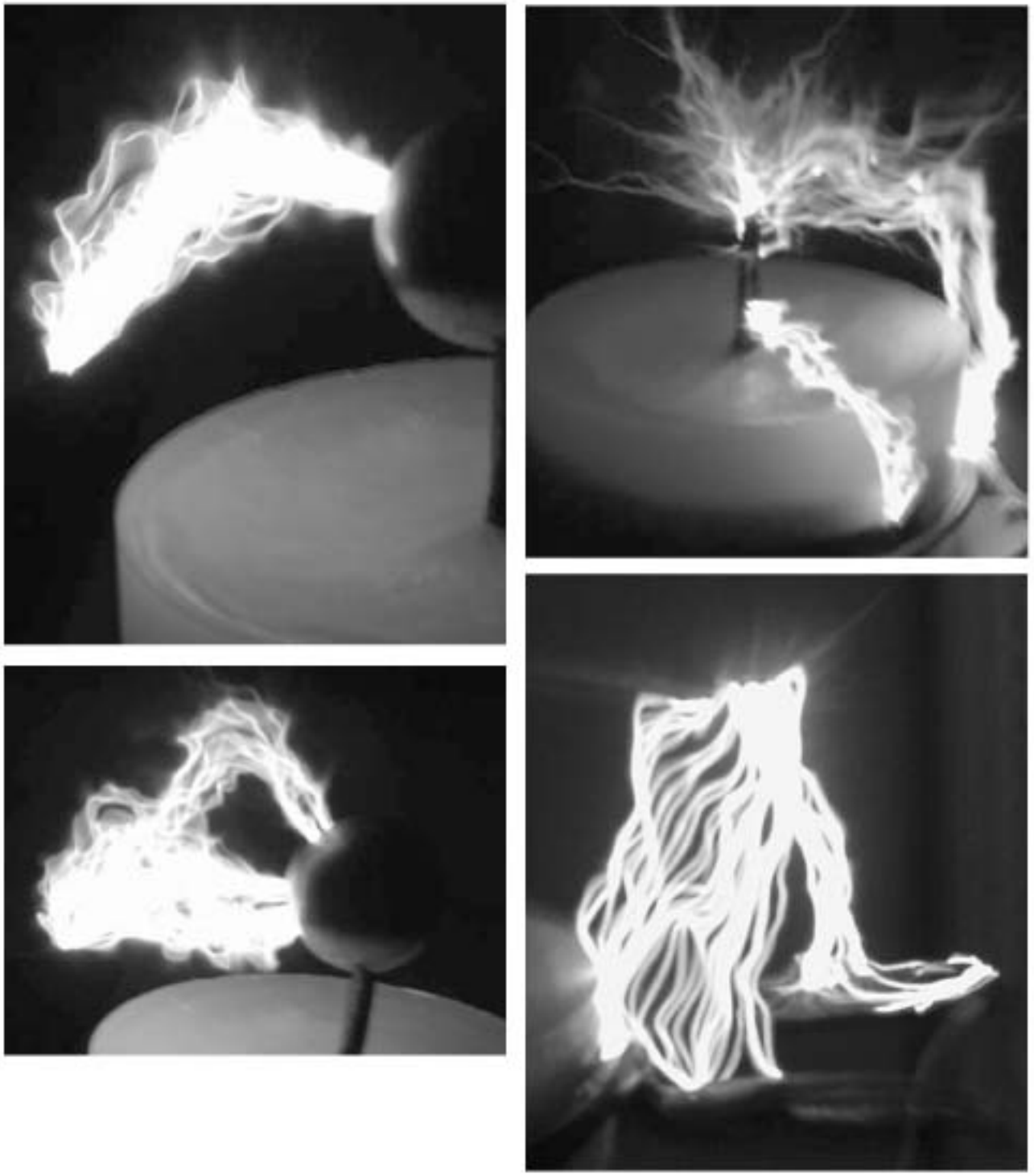
Above: Brilliant Discharge From Quenched Gap Apparatus
Right: Medium Power Discharge from Seeley Electric's Vulcan X-Ray Coil

Tesla Multilayer Disruptive Discharge Coils *and* Quenched Gap Apparatus



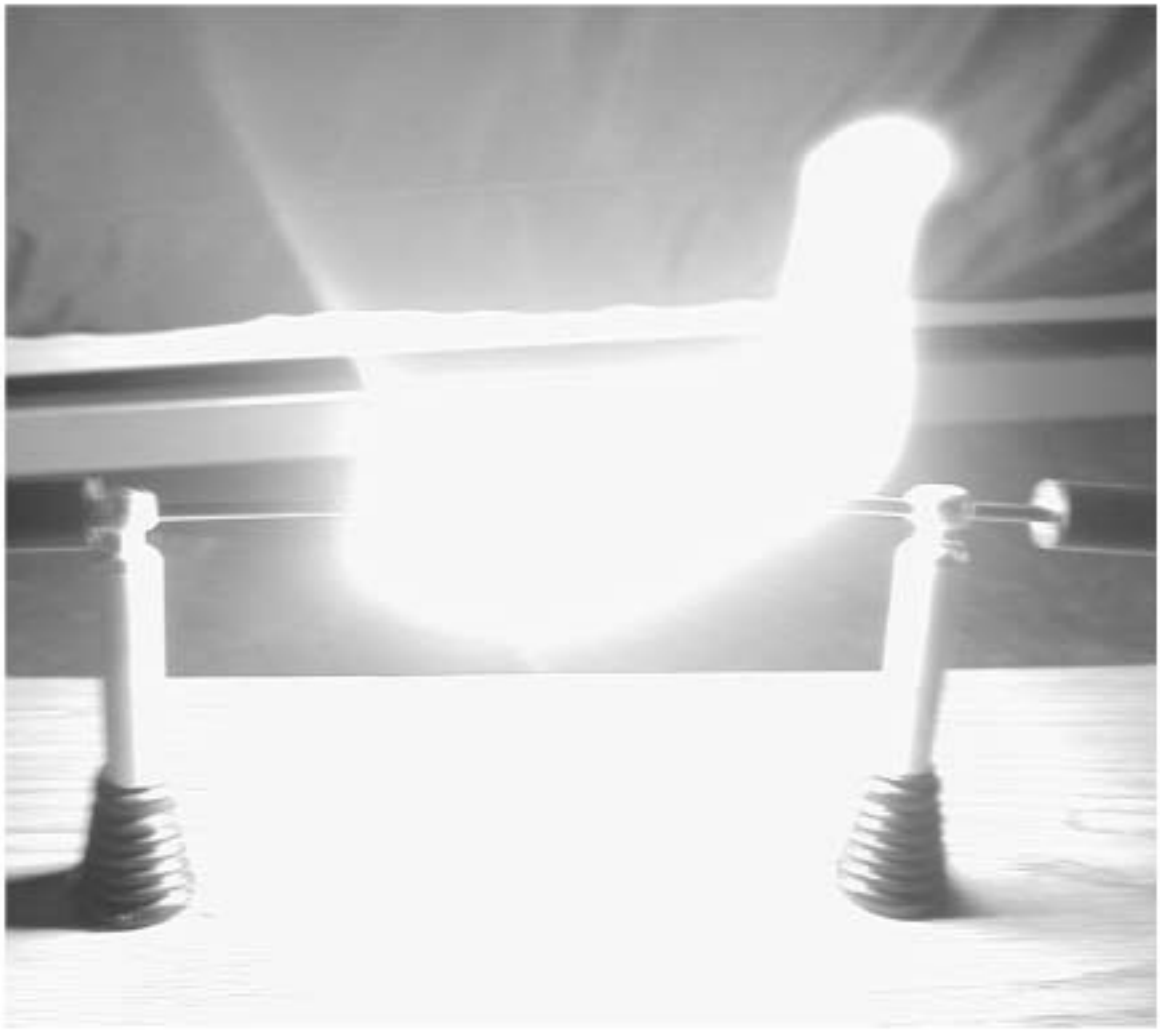
Jeff Behary
The Turn Of The Century Electrotherapy Museum

Tesla Multilayer Disruptive Discharge Coils...



Above: Various High Frequency Flaming Discharges from a Behary 9" Pancake Coil

...and Quenched Gap Apparatus



Close-up of a Flaming-Arcing Discharge from Behary 4" Tesla X-Ray Coil
This discharge is *Several Thousand Degrees*, and can disintegrate the Tungsten Discharging Rods

To William Wysock and James Hardesty, for their constant enthusiasm in my work; to Rita, Felicity, and Io, for accepting the author for who he is and allowing him to have the perfect life; to Peter Barvoets, for introducing me to some invaluable medical texts; and, of course, to the memory of Nikola Tesla, for whom this volume exists.

PREFACE

Amidst a brief duration of existance one tends to search infinitely in a quest for beauty and in a quest for knowledge. There is perhaps no greater source of these ideals, nor to the extent in which they exist, as in the researches and experiments of Nikola Tesla (1856 - 1943).

Upon his passing a door was closed through which unearthly powerful discharges and eerie blue snakelike streamers of electricity hissed and faded, dieing off to little more than colorful descriptions in century-old texts.

The unique experience of knowledge and beauty in the eyes of Nikola Tesla have since been faded, and left to the mercy of skeptics and writers with quests of profit and publicity. This has led to innumerable occassions of injustice where the researches and experiments of the greatest inventor of our time has been reduced to little more than 'fringe science'.

With this book the author introduces the world to the inventions of Nikola Tesla in not only a truthful but beautiful light - combining both color and black and white photos with specific construction details and modern reproduction hints.

J B

PATIENT RECEIVING TREATMENTS FROM A OUDIN RESONATOR

Introduction

The first Tesla Coils ever to reach the public were sold for medical use. What most Tesla enthusiasts do not realise is the sheer volume of coils that were on the market from the 1890s - 1940s. Some of these coils continued to be marketed in the 1950s and 1960s, and several of which are still on the market today.

Originally these coils were sold for authentic medical and x-ray use; however, as of the 1920s many companies started to give false claims to their units.

These false claims were adopted by many 'irregular practicioners' of the time (known these days as 'quacks'), and were generally limited to the 'home treatment' versions of the larger apparatus.

Eventually these claims were brought to court and soon many of the smaller companies went out of business as a result. In the 1930s many of the portable units were marketed towards women and sold for cosmetic and beautician use - which they still are to some extent today.

MASTER ELECTRIC COMPANY VIOLET RAY NO. 10

Pictured above is one such example of a portable unit. These units, referred to as "Violet Ray" High Frequency Devices, were manufactured by over 4 dozen manufacturers in the United States alone - each with up to a dozen models of machines or more available.

The basic principle by which these devices operate is known as the 'Kicking Coil' method of producing high frequency currents. This novel method allows apparatus to operate on either direct or alternating currents. This was of great advantage during the first decade of the 1900s, when various modalities of electric were available to a limited extent. Even if no electricity was available for bedside treatments one could rely on a bank of storage batteries.

A kicking coil is a solenoid of copper wire wound upon a laminated core of either silicone steel or soft iron wires in a bundle. For X-Ray apparatus this wire is rather coarse, 20 or 21 AWG. For small 'Violet Ray' devices, it is finer wire of 30-32 AWG. If a current is sent through this winding, and then suddenly thecircuit is broken a pronounced arc will occur at the break of contact. This high potential is induced by the self-induction of the coil. By various experiments in the number of turns and the number of layers in the coil this voltage generated may easily reach 1000 volts - an excellent voltage for charging a condenser. The best method of utilising this effect is to arrange the self-induction 'Kicking Coil' in a manner similar to an induction coil. By means of an interrupter or mercury break the condenser can be made to discharge through the primary of a Disruptive Discharge Coil.

VIOLET RAYS

The Violet Ray is a pleasant, effective means of applying the wonderful power of electricity to the human body without pain, sensation or shock, and is without an equal in relieving pain and congestion, stimulating the circulation and restoring good health, vigor and youth.

The Violet Ray is the ordinary electric current obtained from any socket, nebulized and split up into infinite parts and produced through glass applicators called electrodes, in a violet colored stream, hence its name, VIOLET RAY. A huge voltage of electricity is obtained and applied to the body or hair but without any shock, whatever, the only sensation being a pleasant warmth.

Violet Ray Treatments surely relieve pain in any part of the body. The electrical currents penetrate every cell and tissue of the body, and tranquilize and soothe. Violet Rays stimulate and strengthen the vital organs, build up the natural forces, steady the nerves, and develop the general health and conditions of the body. High frequency electrical currents carry oxygen to the blood, thus purifying this vital body fluid. Violet Rays equalize the circulation in congested parts and restore bruised and inflamed tissues to normal.

A Master Violet Ray is applied through vacuum applicators or electrodes made of annealed glass. These electrodes diffuse the electrical current in sprays of a beautiful deep violet color. These sprays or sparks vibrate to and fro, or oscillate at the rate of several hundred thousand times per second. This rapid vibration is what produces the pleasing, invigorating and corrective effects derived from Violet Ray Treatments.

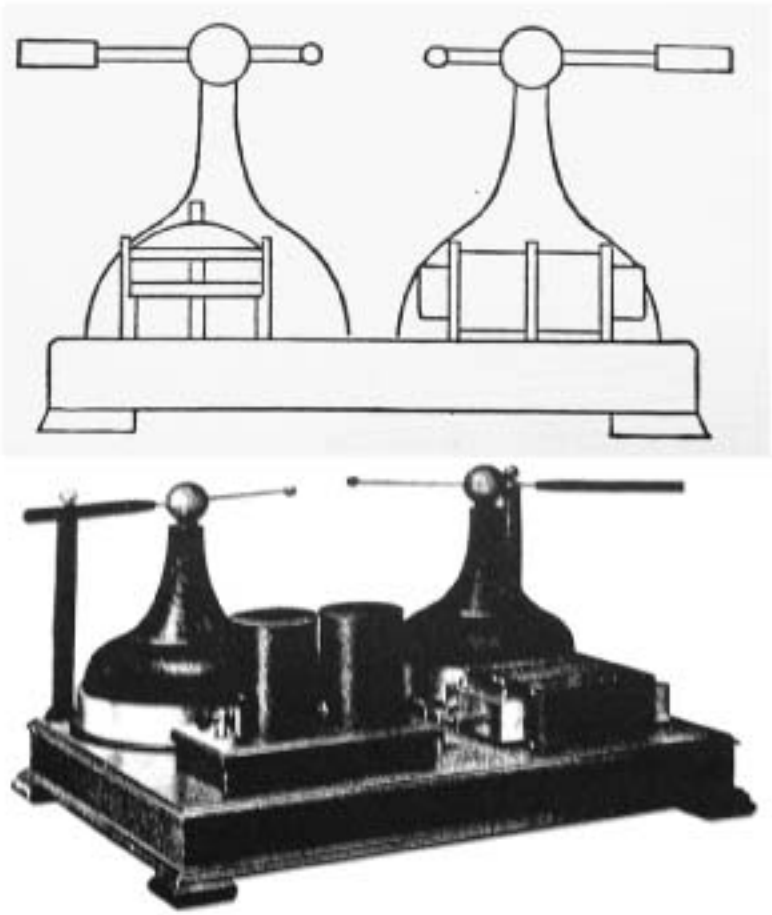
A few minutes' application each day, simply holding the applicator in the hand, furnishes a tonic to the system which does much to fight disease and keep the body in a healthy state. Inasmuch as prevention is to be desired a thousandfold rather than a cure, this one point alone makes the Master Violet Ray indispensable in your home.

Many authorities state that impaired circulation of the blood causes most ailments. The Violet Ray by stimulating the circulation, thus wards off disease, saving you much unhappiness and suffering.

With the knowledge that electricity, Nature's greatest health agent, was a vital factor in the treatment of various diseases of the body, there has been a constant untiring effort to improve the method of application and increase the power of this wonderful agent.

The wide use of electricity produced through various types of apparatus finally led to the discovery of the Violet Ray, otherwise known as High Frequency, which has solved many problems and today furnishes the most efficient and powerful phase of electricity known for the relief and destruction of the various diseases and germs of the body.

EXCERPT FROM MASTER ELECTRIC'S 'MASTER VIOLET RAYS'



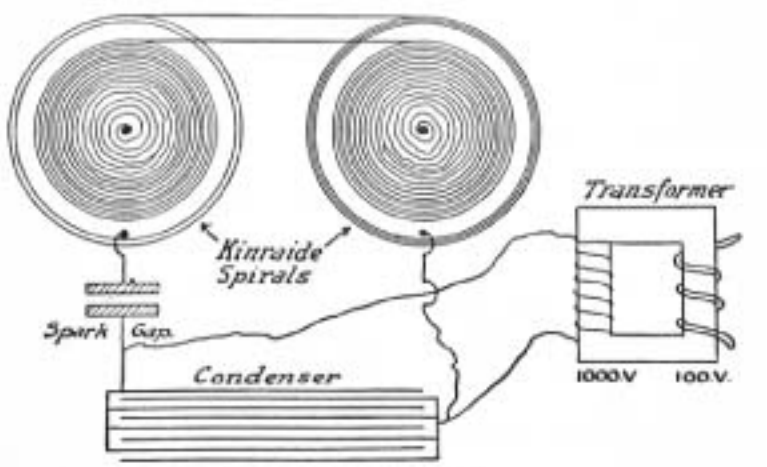
ABOVE: THE ORIGINAL KINRAIDE COIL; BELOW: KINRAIDE COIL WITH IMPROVED SPARK GAP

The introduction of the 'Violet Ray' device caused an explosion of Tesla Coils to be marketed in the 1920s and 30s. Before the discussion of these apparatus, the author would like first to describe some of the first Tesla Coils ever to be marketed. They remain to be some of the most spectacular machines ever designed.

The first Tesla Coil to be placed on the market was "The Knott Coil" in 1897. This coil was designed primarily for x-ray use. It consisted of an oil-immersed bi-polar Tesla Coil, in a wooden housing which contained the transformer and condenser. A Rotary Spark Gap was placed to the right of two discharging pillars on the top of the unit.

In 1901 the "Kinraide X-Ray Coil" made it's way to the market. While the spark gap was somewhat unreliable in the early machines, this coil proved to be one of the most powerful and efficient Tesla Coils designed.

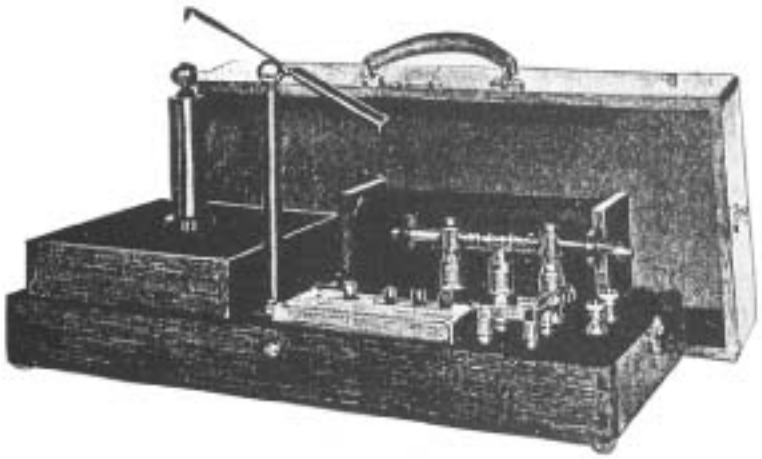
The "Strong-Ovington" Apparatus appeared on the market in 1902, after being used in practice by Dr. Frederick Finch Strong since 1896. Dr. Strong was a leading authority on high frequency currents, and was the inventor of the vacuum electrode.



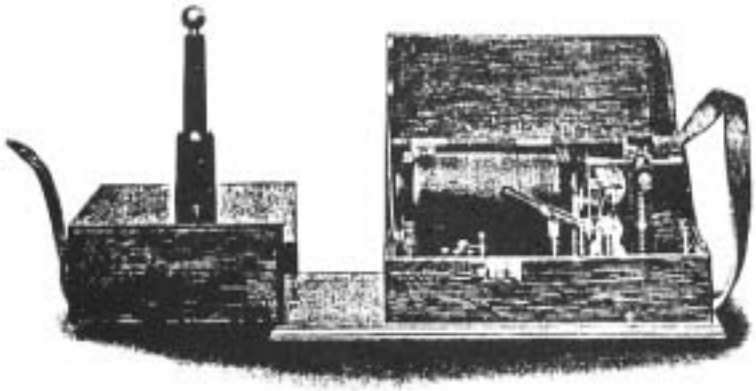
WIRING DIAGRAM OF KINRAIDE APPARATUS. THE ORIGINAL DEVICES USED ELECTRIC LIGHT CARBONS FOR THE SPARK GAP.

Kinraide's alternating current apparatus were designed to operate on an Alternating Current of 104 Volts. This current passed through a small closed circuit transformer that has an output of 1000 Volts. The condensers is these units were of large value and made from tin foil sheets and built-up mica sheets. The discharge of the spark gap occured between two copper plates in series with the two primary coils of the multilayer disruptive discharge coils. Each primary coil consisted of 6 turns of copper ribbon, 8" in diameter and 1" wide. The secondary coil was thin wire meticulously interleaved and wound in the same plane. It fit snuggly within the primary. The two high frequency coils used in the Kinraide apparatus were wound oppositely or symmetrically, the outer ends of both the primaries and secondaries being connected to a single grounded binding post.

RIGHT: SMALL COIL WOUND IN A SIMILAR MANNER TO THE 'KINRAIDE COIL'. THESE COILS WERE USED IN PORTABLE APPARATUS SUCH AS FISCHER'S TYPE M VIOLET RAY AND A.S. ALOE LIGHTENING MACHINES



CAMPBELL HIGH FREQUENCY COIL

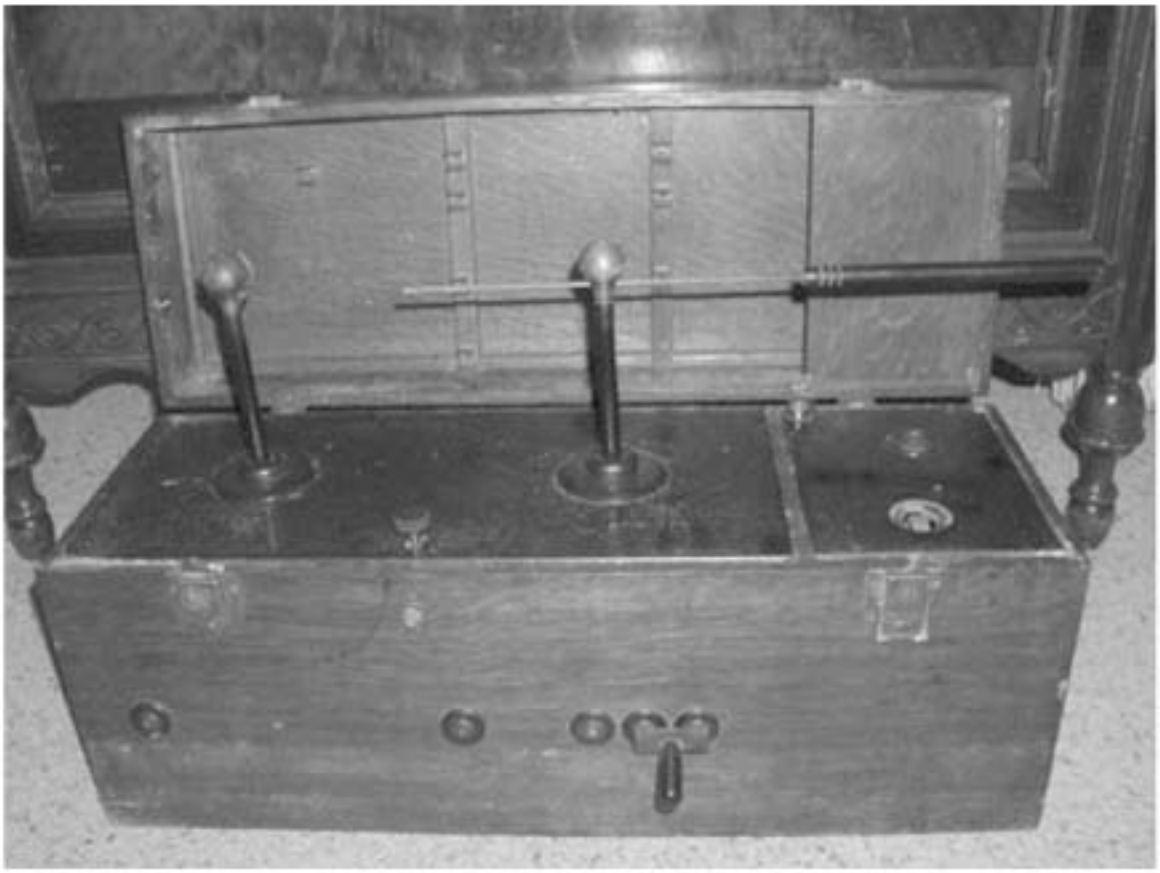


BROWN HIGH FREQUENCY COIL

Following the release of the Kinraide Coils, several other apparatus were marketed with improved designs. Similar apparatus would soon become available from Frank S. Betz, Victor, Seeley Electric, Campbell, Brown, Scheidel-Western, H.G. Fischer Company, and others.

Before going into details concerning the construction of these units, the author would like to conclude the first chapter with images of Turn Of The Century Electrotherapeutic Apparatus that utilise Tesla Multilayer Disruptive Discharge Coils and/or Quenched Spark Gaps. An indexed list of descriptions for these photos conclude this chapter.

(While it is beyond the scope of this book to catalog all of the various apparatus, the author has dedicated many years to the subject and regrets at the current time not to be able to publish volumes of books on the subject. This *is* however 'in the works' and will be published in the future, perhaps in 2002. Questions regarding individual units and manufacturers can be directed towards the author in the meantime.)

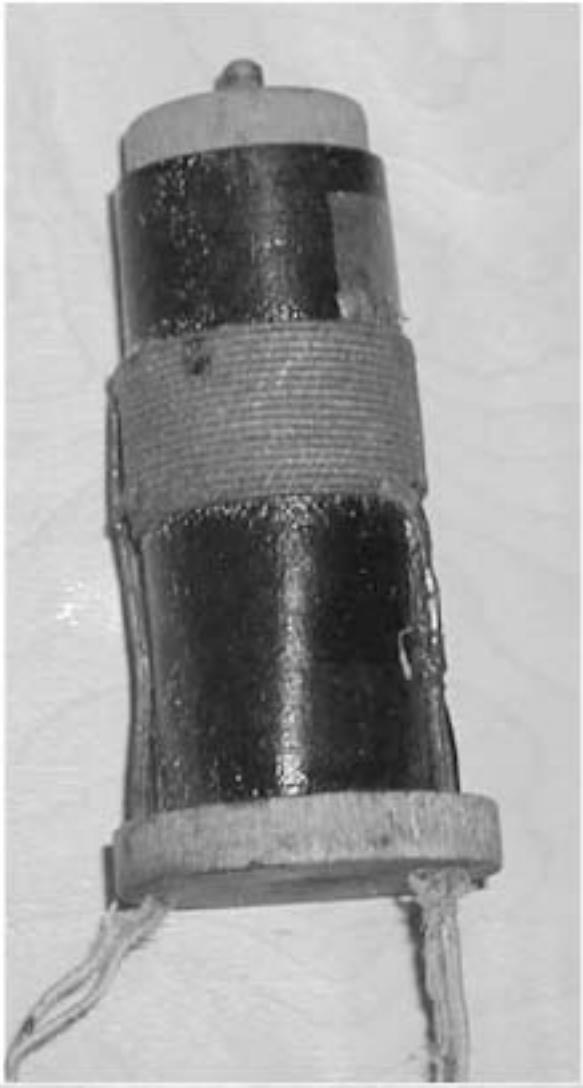


Seeley Electric's VULCAN Coil - an amazing apparatus!

Kinraide-style Coils as used in the Vulcan Coil

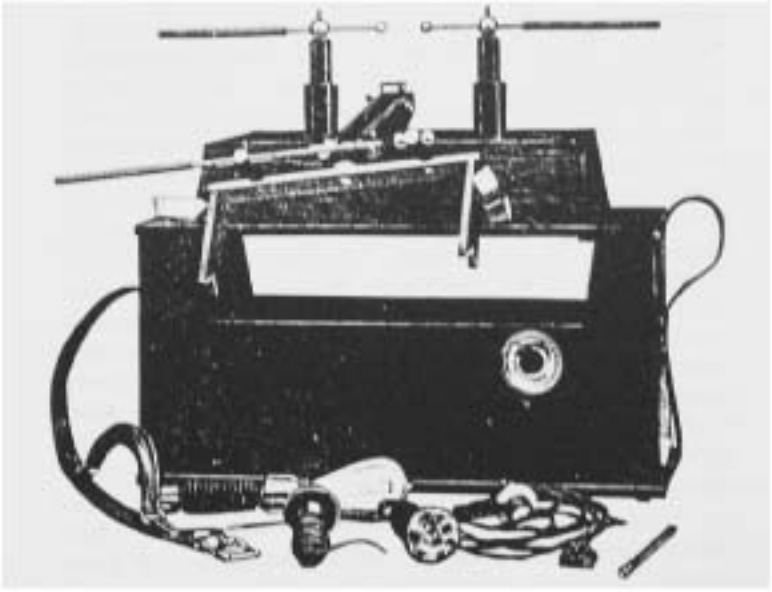
Close-up of Multilayer Disruptive Discharge Coils

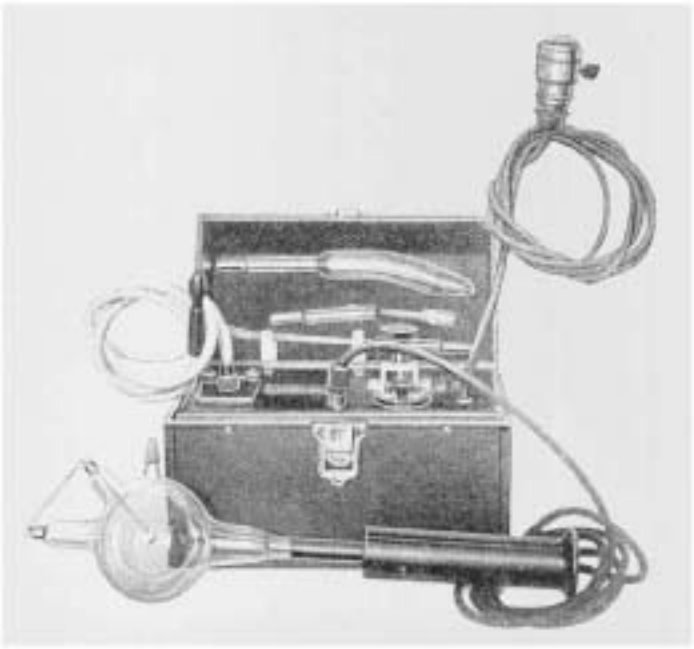
Small Disruptive Discharge Coil as used in
Frank S. Betz and H.G. Fischer Violet Rays; A.S. Aloe 'Lightening' Machines;
Thompson Plaster units; and various smaller Portable Outfits

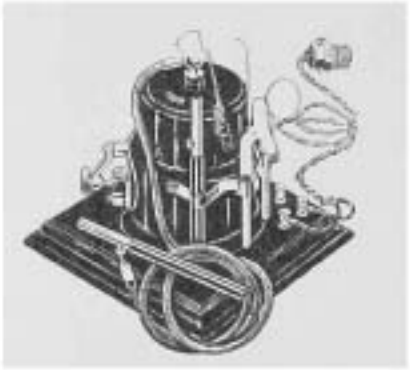


Various small Disruptive Discharge Coils as used in Portable Violet Ray Devices.

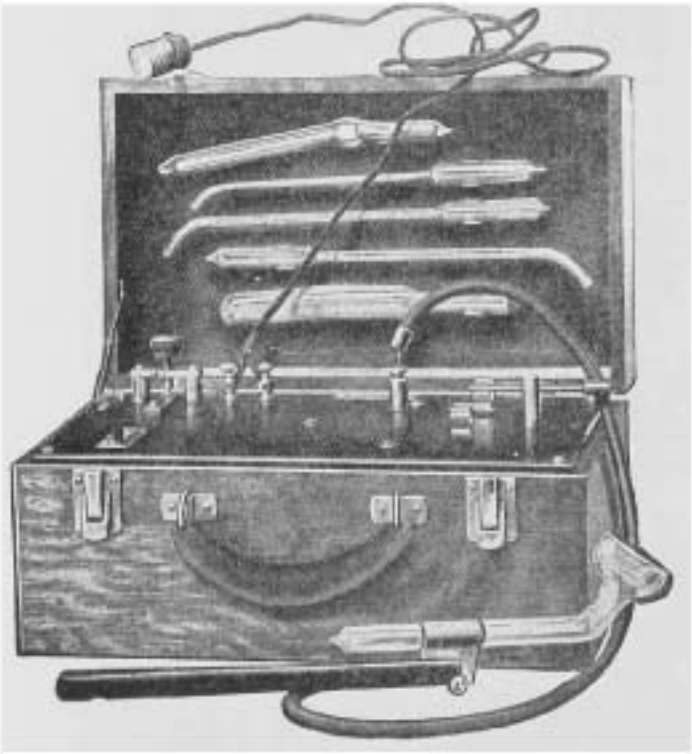
Tesla Multilayer Disruptive Discharge Coils...

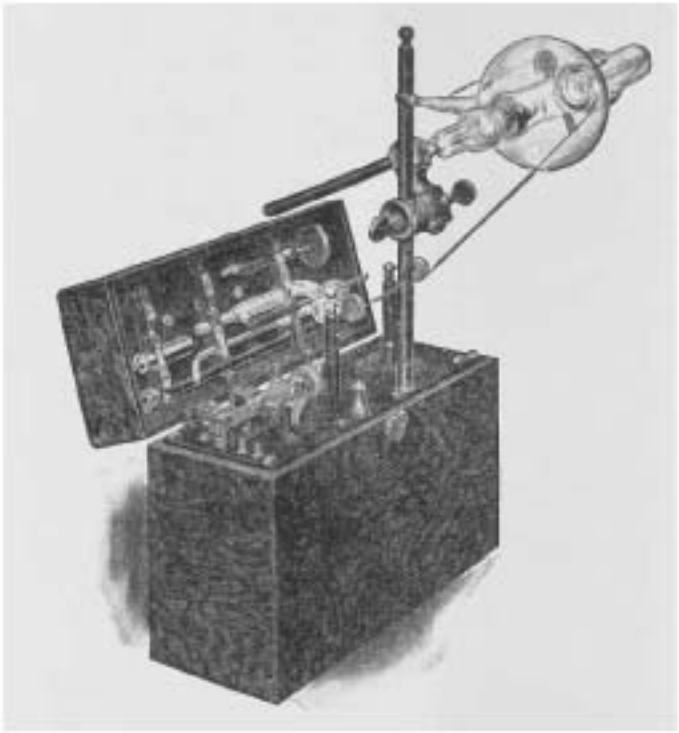




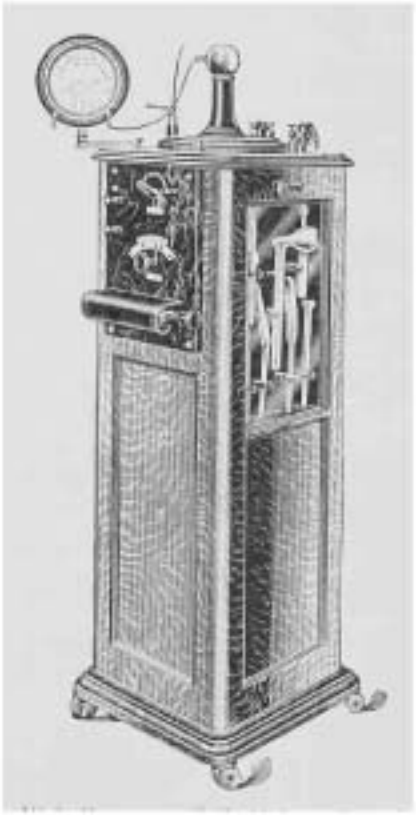


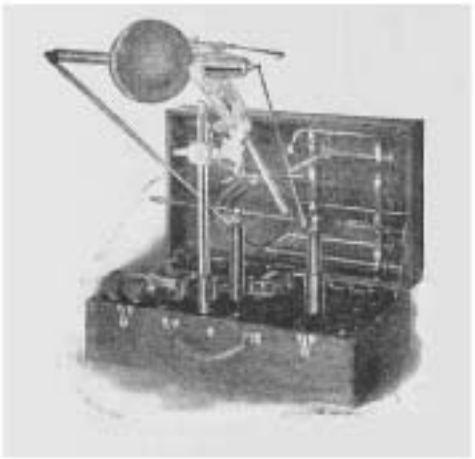
...and Quenched Gap Apparatus

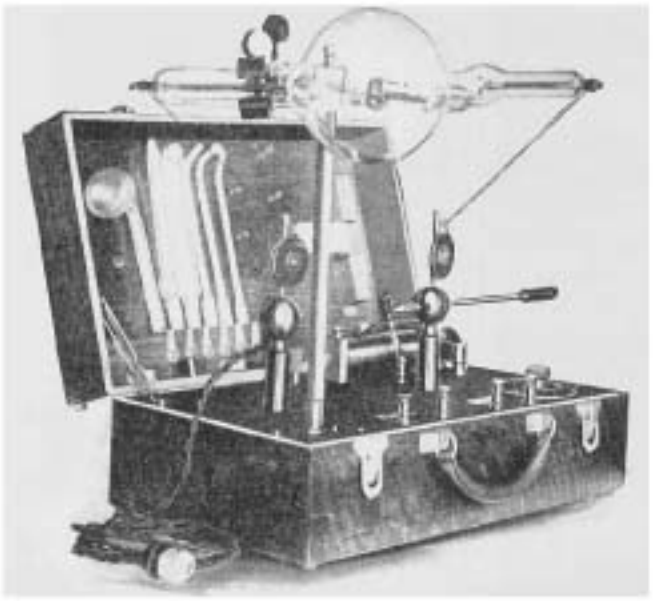




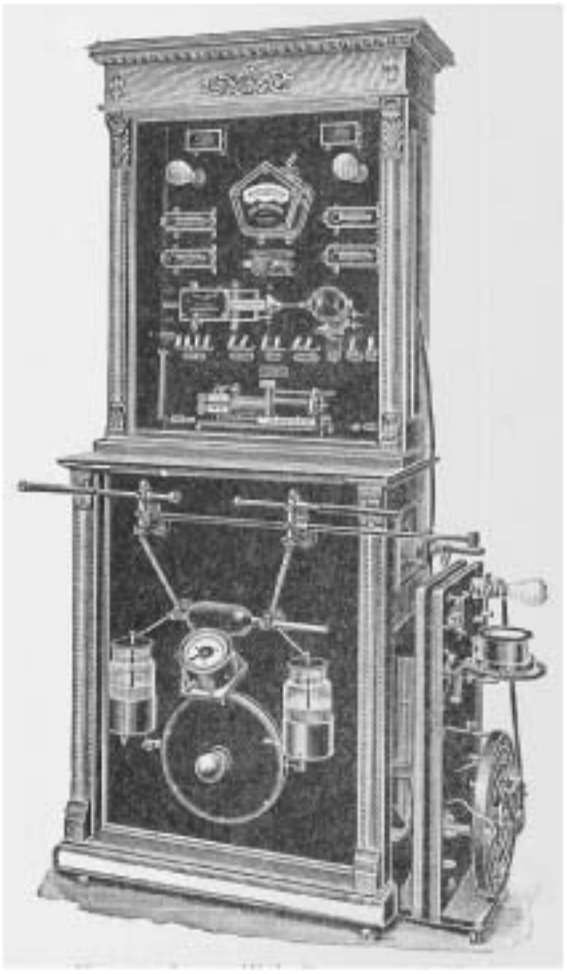
Tesla Multilayer Disruptive Discharge Coils...

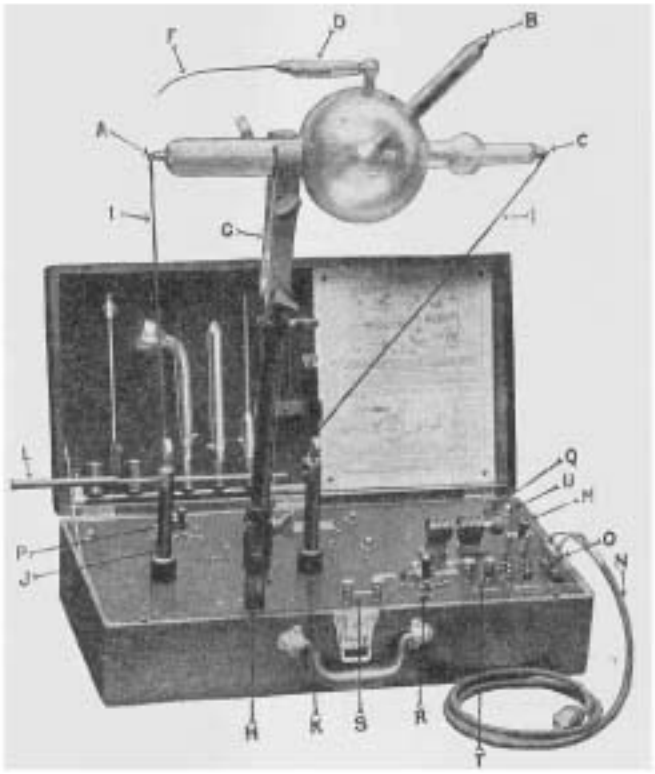






...and Quenched Gap Apparatus

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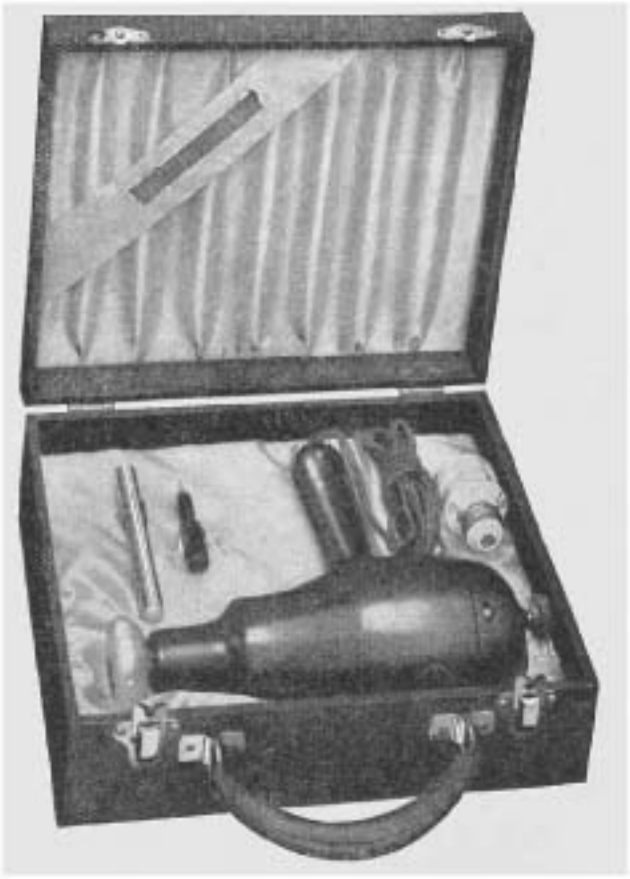
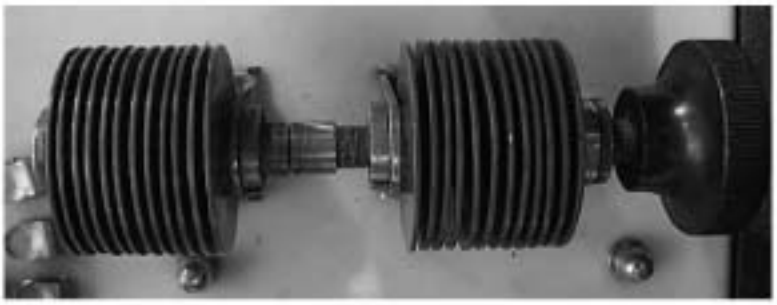
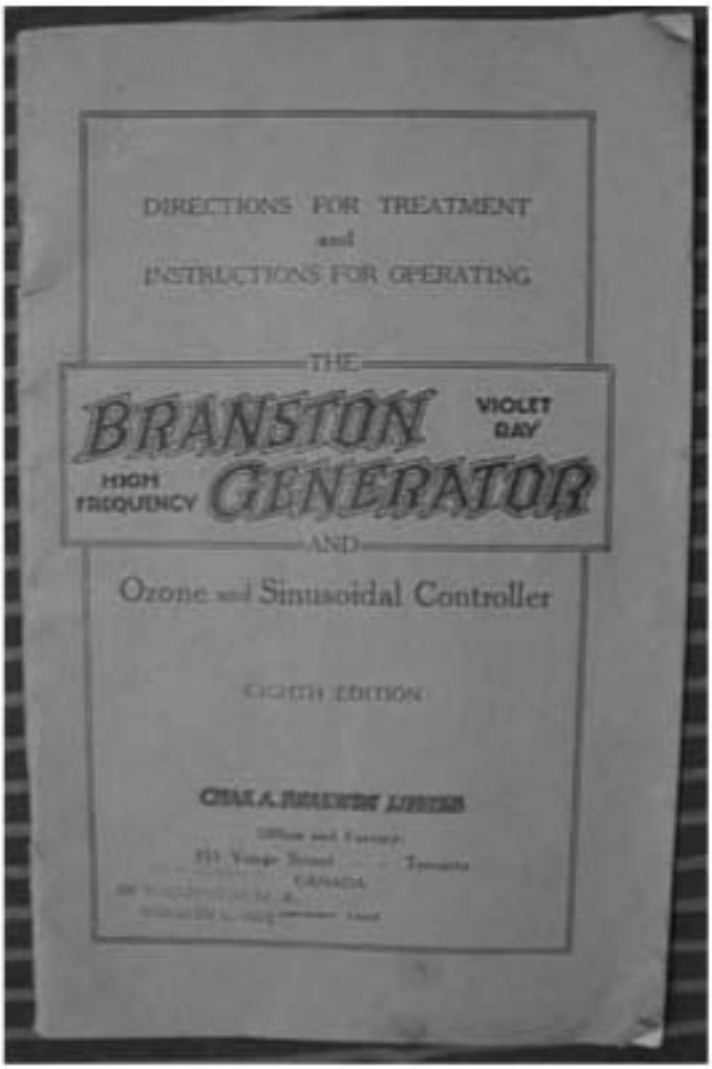
Tesla Multilayer Disruptive Discharge Coils...





...and Quenched Gap Apparatus

Tesla Multilayer Disruptive Discharge Coils...



...and Quenched Gap Apparatus

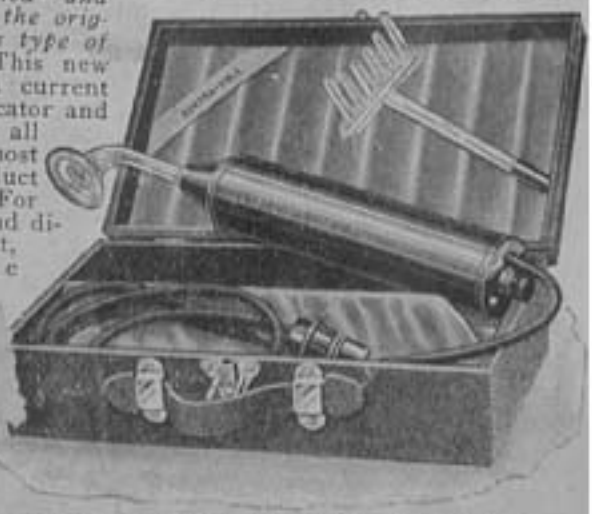
THE BRANSTON VIOLET RAY

WARNING

Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

No. 1. Contra-Pole Home Outfit. A self-contained one-piece Violet Ray machine, simple in construction, easy to operate, *designed and improved by the originator of this type of apparatus.* This new model has a current strength indicator and presents in all details the most perfect product of its kind. For alternating and direct current, The Home Outfit includes the *Contra-Pole Generator*, a general applicator, a comb applicator, for scalp treatments, seven feet of cord with attachment plug and instruction book, all contained in an elegant satin-lined, imitation leather carrying case.



Price, complete..... **$30.00**

Tesla Multilayer Disruptive Discharge Coils...

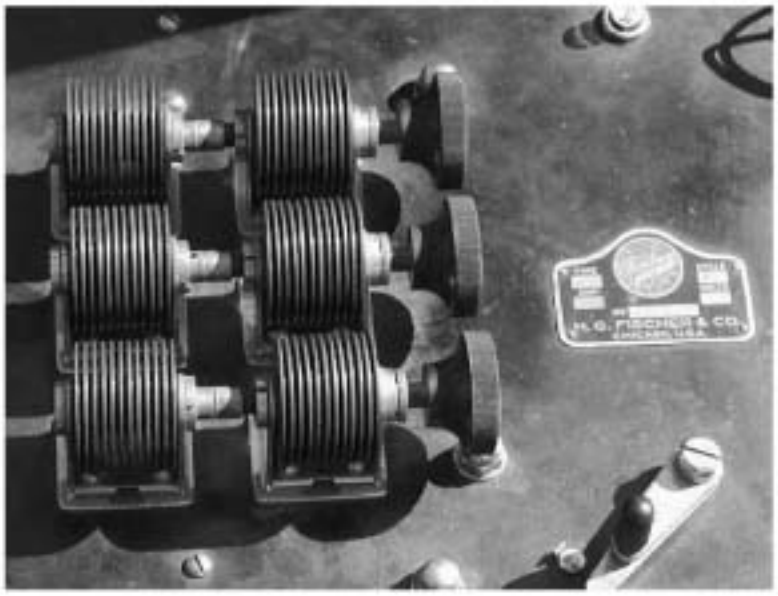
...and Quenched Gap Apparatus

Fischer
CHICAGO.ILL

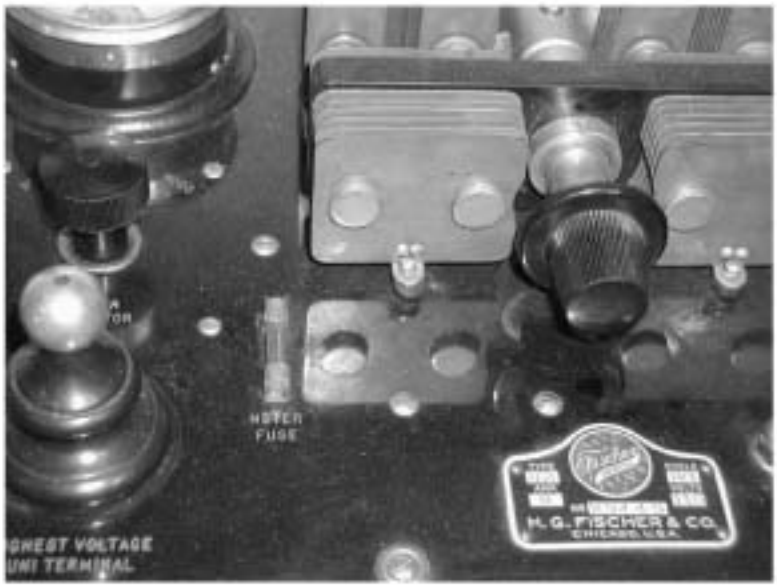
Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

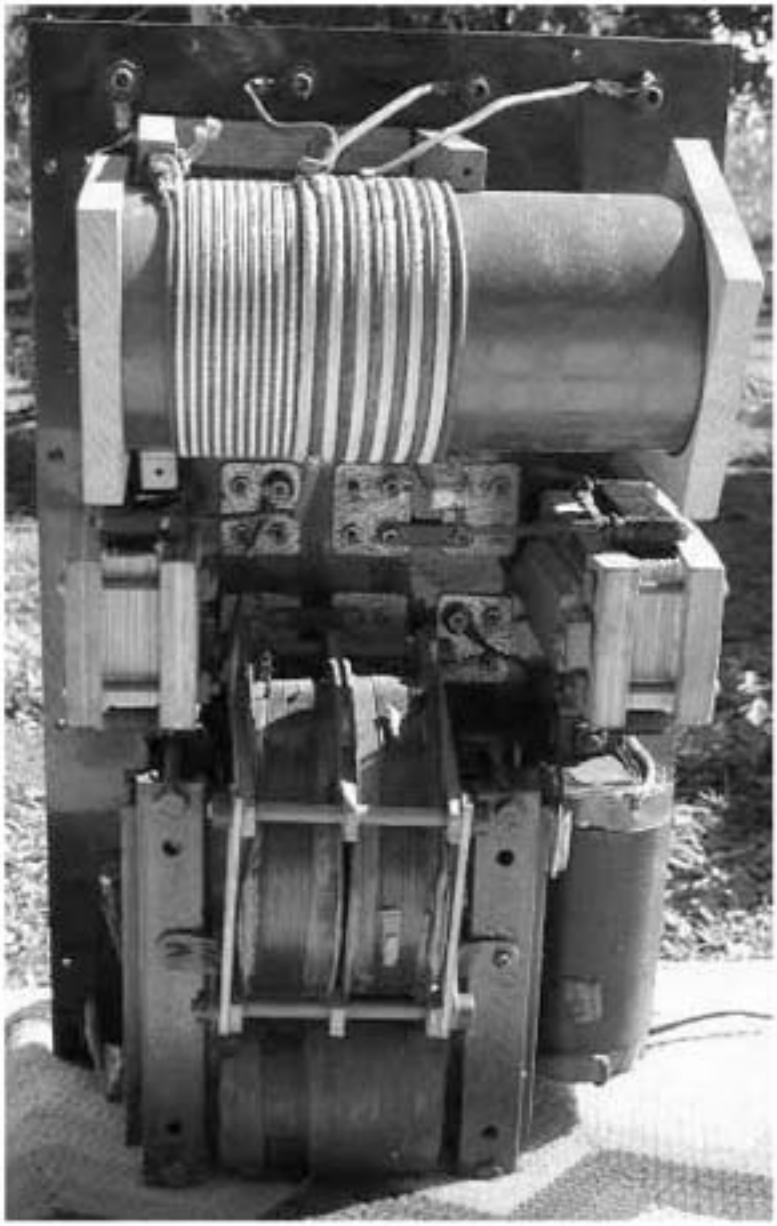
Tesla Multilayer Disruptive Discharge Coils...

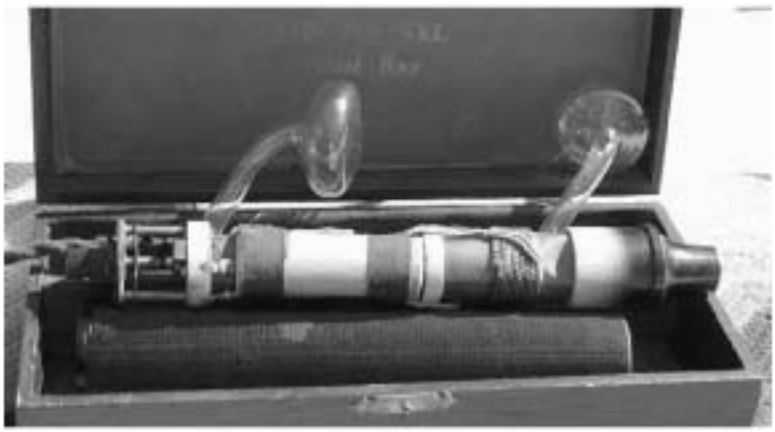


...and Quenched Gap Apparatus


FUSE
H. G. FISCHER & CO.

Tesla Multilayer Disruptive Discharge Coils...





...and Quenched Gap Apparatus

Super Marvel No. 3

Marvel Special No. 5

Marvel Special No. 5 B

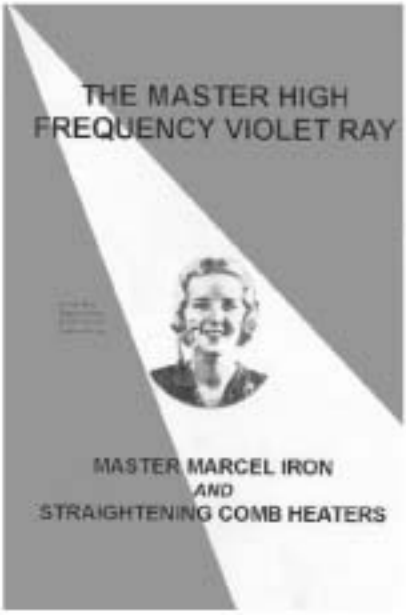
Same as above with cautery instead of condenser electrode

Tesla Multilayer Disruptive Discharge Coils...

Marvel Ozone No. 7

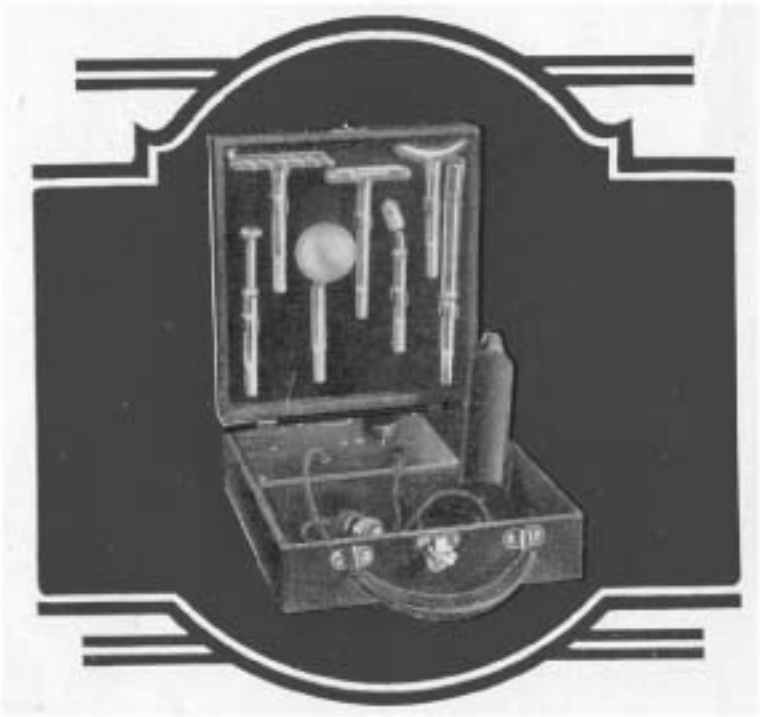
Marvel No. A 1

...and Quenched Gap Apparatus


THE MASTER HIGH
FREQUENCY VIOLET RAY
MASTER MARCEL IRON
AND
STRAIGHTENING COMB HEATERS

MASTER VIOLE
NO. 11

Tesla Multilayer Disruptive Discharge Coils...

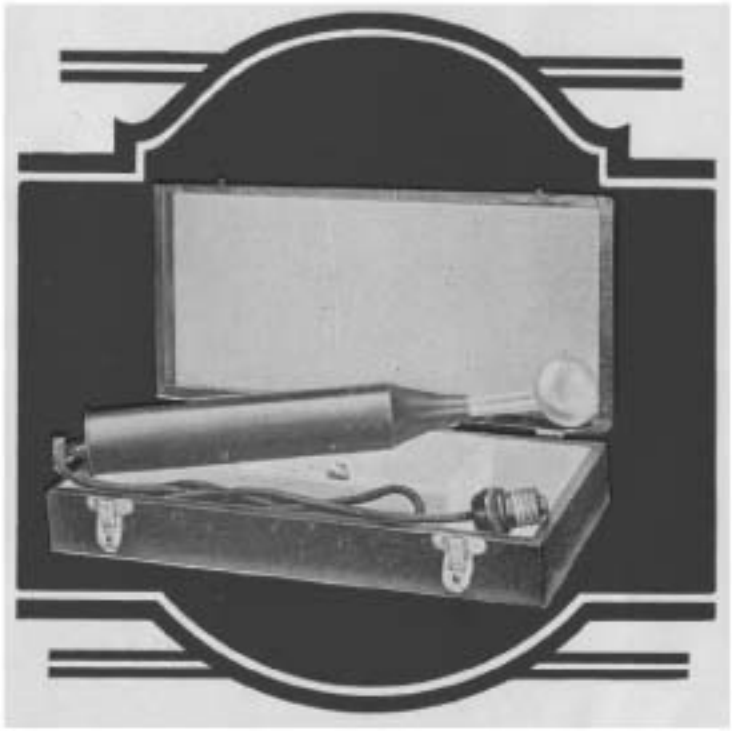


...and Quenched Gap Apparatus

MASTER

Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

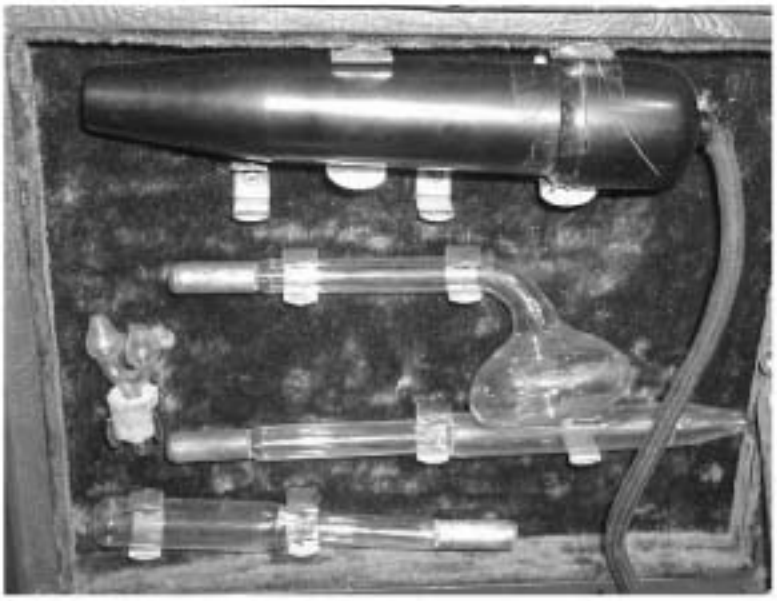


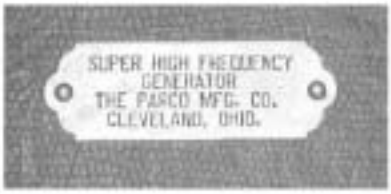
Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

VIOLET RAY OSCILLATOR

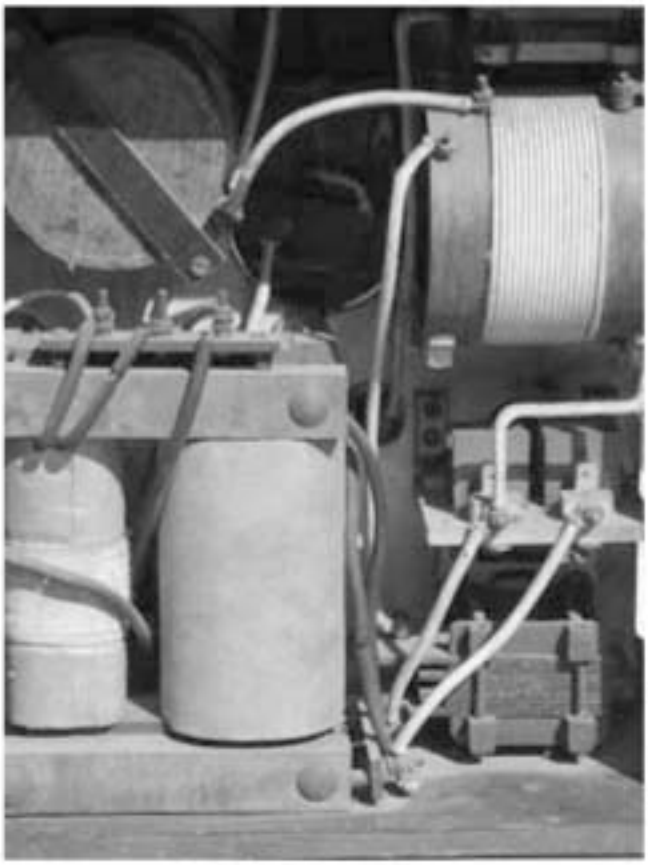
ELECTRA
HIGH
FREQUENCY
APPARATUS
VOLTS
AMPERES
MFG. BY
McINTOSH
ELECTRICAL
CORP
CHICAGO, U.S.A.

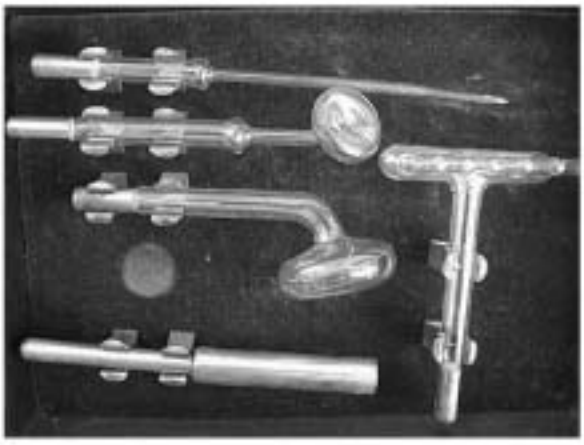



SUPER HIGH FREQUENCY
GENERATOR
THE PARCO MFG. CO.
CLEVELAND, OHIO.

Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus





VIOLET RAY GENERATOR

Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

Model E

Model F

Tesla Multilayer Disruptive Discharge Coils...

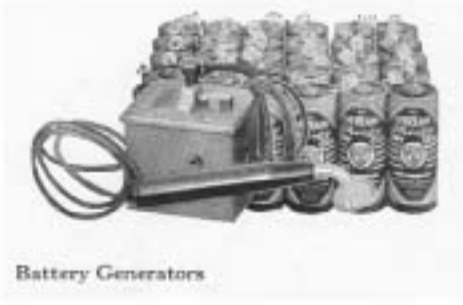
Beauty Parlor Model G

Model A

Dental Model D

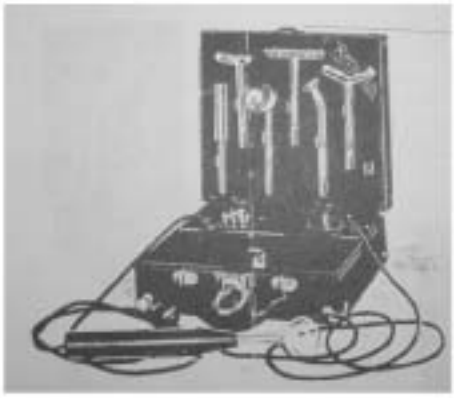
Model B

Model C



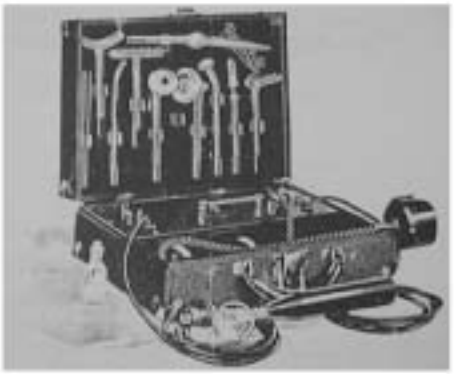
Battery Generators

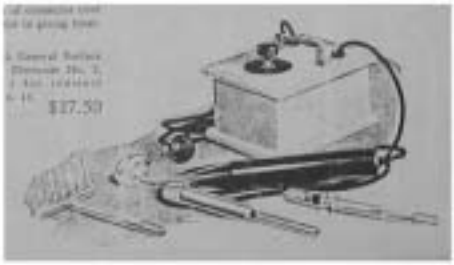
...and Quenched Gap Apparatus

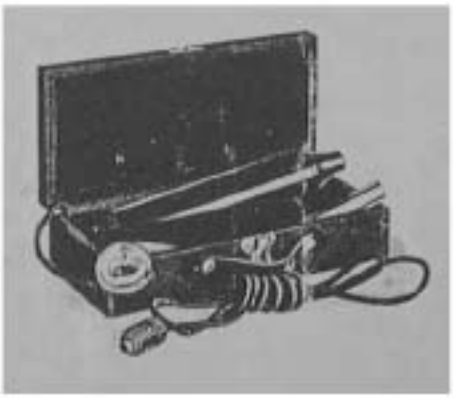


RENULIFE VIOLET RAY CO.
ELECTRO-THERAPEUTIC INSTRUMENTS

RENULIFE ELECTRIC COMPANY




$37.50



Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

Violetta Outfit No. 3

Tesla Multilayer Disruptive Discharge Coils...

VIOLETTA OUTFIT No. 5

VIOLETTA OUTFIT No. 7

MULTIFREX TYPE A1

...and Quenched Gap Apparatus

The VIOLETTA—Type C

The VIOLETTA—Type C1

VIOLETTA DE LUXE

Violetta
Modified

VIOLETTA OUTFIT No. 1

Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

Index of Antique Coil Photos

Page 18: Cyclone Coil; Portable High Frequency Unit with Uni-Polar X-Ray Tube; Portable High Frequency Unit

Page 19: Portable High Frequency Unit for Treatment Work; Portable High Frequency X-Ray Unit

Page 20: Portable High Frequency Unit with Replacement Resonators; Tall Upright d'Arsonval Outfit; Two examples of Portable High Frequency / X-Ray Units

Page 21: Large Induction Coil / Leyden Jar High Frequency Machine; Scheidel Western X-Ray Outfit; Thompson Plaster Physician's Cabinet

Page 22: Portable High Frequency Outfit in the shape of a Vibrator; A.S. Aloe Lightning Machine

Page 23: A.S. Aloe Super Diatherm and Lightning Machines

Page 24: Chas. A. Branston Violet Rays

Page 25: Chas A. Branston Violet Rays and Cesco Violet Rays

Page 26: Cesco Violet Ray; Contra-Pole Violet Rays

Page 27: Contra-Pole Home Outfit; Elco Linstrom Violet Ray with Sinusoidal Currents

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Page 32: H.G. Fischer Type GP Diathermy Machine; Spark Meter

Page 33: H.G. Fischer Type G2 Diathermy Machine

Page 34: H.G. Fischer Type GP Diathermy Machine; Note the d'Arsonval Coils, Mica Condensers, and High Tension Transformer/Reactance Coil; Eastern Laboratories Marvel Violet Ray out of housing

Page 35: H.G. Fischer Type H Diathermy Machine (12 amps!); Eastern Laboratories Marvel and Super-Marvel Violet Ray Units

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Page 37: Master Appliance Violet Rays; Master Electric No. 11 Violet Ray

Pages 38 - 42: Master Electric Violet Rays

Page 43: McIntosh High Frequency Diathermy Outfit; Violet Ray Oscillator (Battery Operated); Parco Violet Ray

Page 44: Parco Violet Rays; Peerless Portatherm Diathermy Unit

Page 45: Portatherm Diathermy Unit; Re'juvin Violet Rays

Pages 46 - 49: Renulife Violet Rays

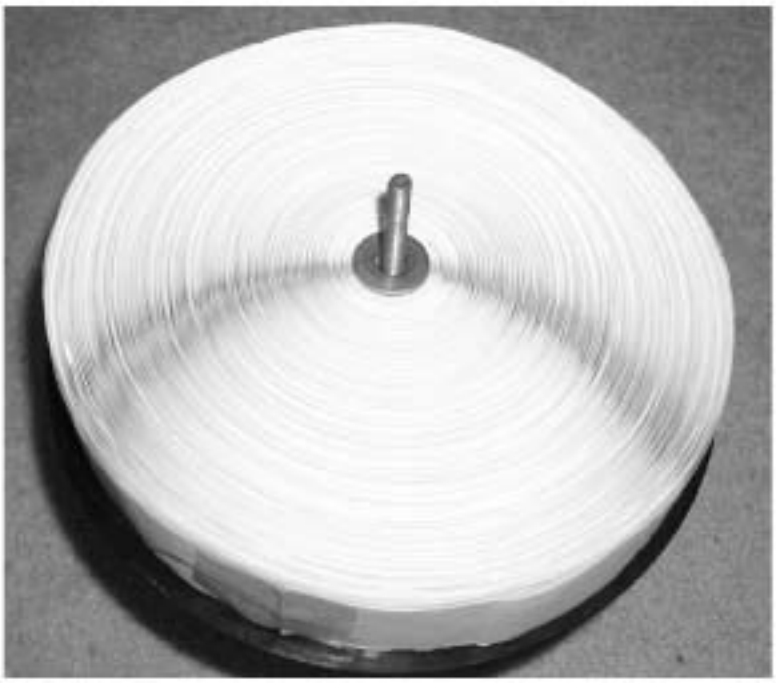
Page 50 - 53: Bleadon Dun Violetta Violet Rays

Page 54: Haliwell Shelton / Shelton Gentry Violet Rays

Page 55: Haliwell Shelton Violet Ray; Tucker's Violet Ray; Violet Ray Corp Violet Ray

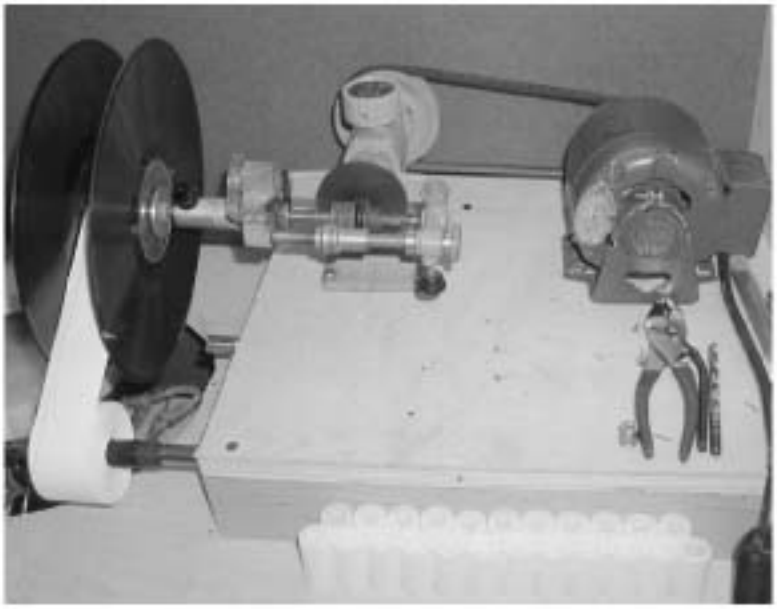
Notes

Notes



Example of Pancake Style Multilayer Disruptive Discharge Coil, Before impregnation

Before getting into the actual styles and winding techniques for Multilayer Disruptive Discharge Coils, it is first vital to discuss the construction of a coil winder suitable for the purpose.



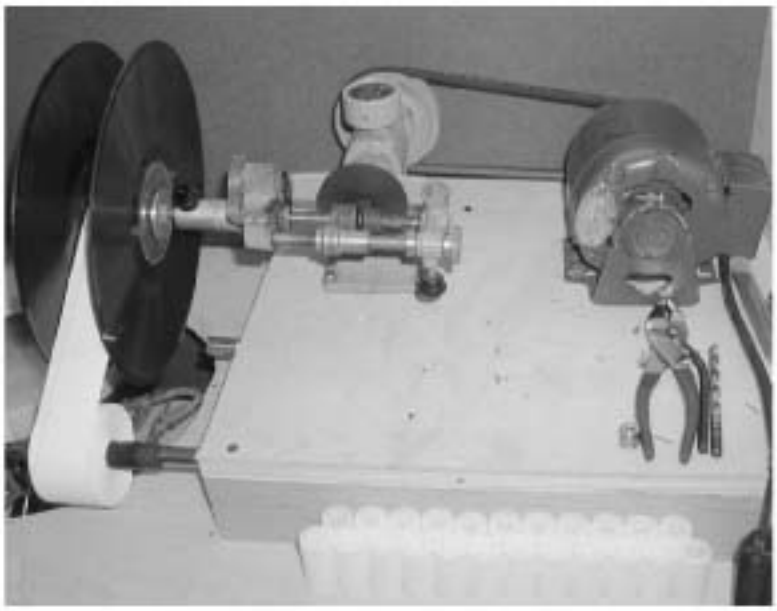
Above is a coil winder designed by the author expressly for the purpose of winding Multilayer Disruptive Discharge Coils.

The author originally purchased a 1950s Cenco Coil Winder. After finding the original arrangement unsatisfactory, the following rearrangements were adopted.

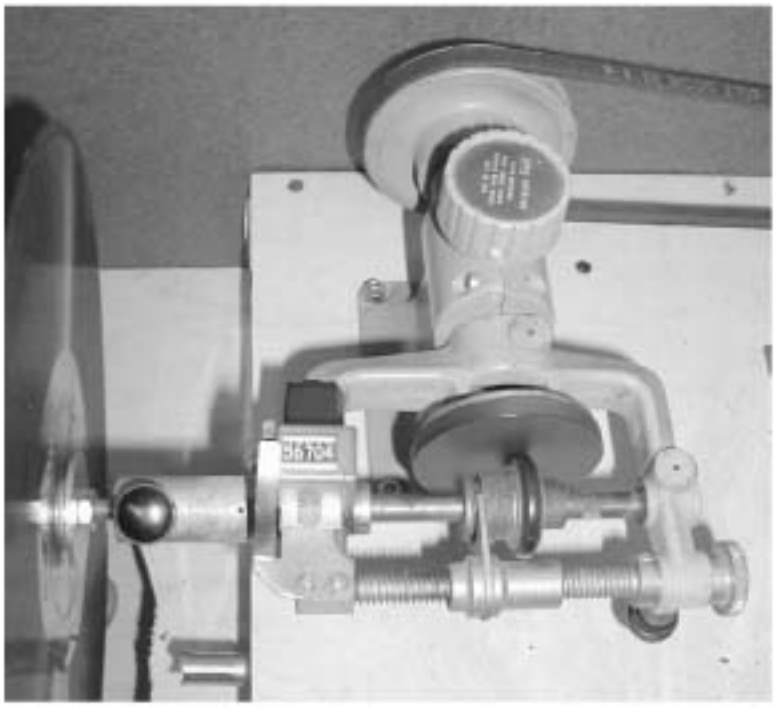
The motor seen is 1/20 HP. It drives a belt that turns a 2.5" diameter Fiber disk. Pressing firmly against this disk is an O-ring assembly that is attatched to a threaded gear. By varying the horizontal location of the O-ring against the rotating disk, the speed of the winder can be adjusted from several dozen RPM to several thousand.

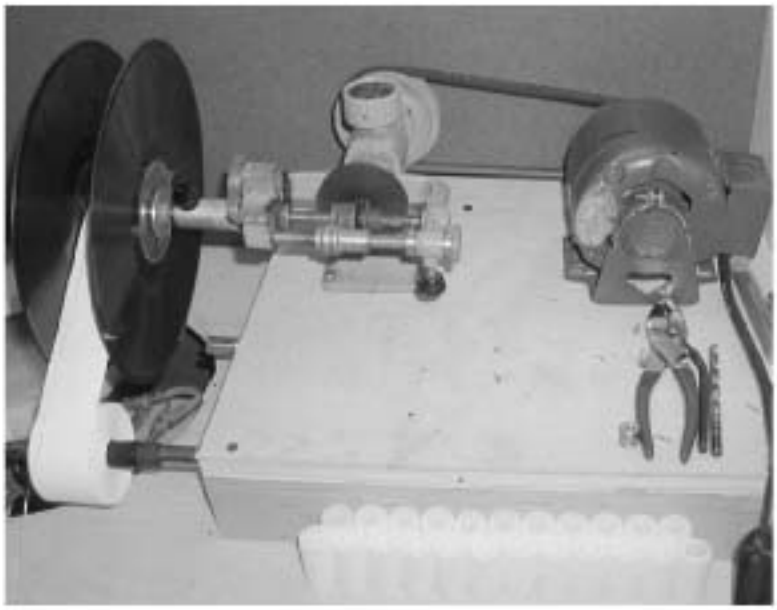
When this O-ring is placed on the left side of the disk the assembly will turn away from the operator, and when placed on the right of the disk will turn towards the operator. This function is useful for producing bi-polar sets of coils. For most coils and apparatus, one will want the coil to spin away from oneself for ease of operations.

The O-ring assembly is connected to a spool-holder, which is actually an aluminum piece of bar stock with a 5/16 hole in it's center. Placed perpendicular to this hole is a threaded rod and knob, to act as a set-screw to hold the bobbin in place.



More details of this assembly can be seen below. For convenience, there is also a counter that the operator can use to keep track of the number of turns of wire.

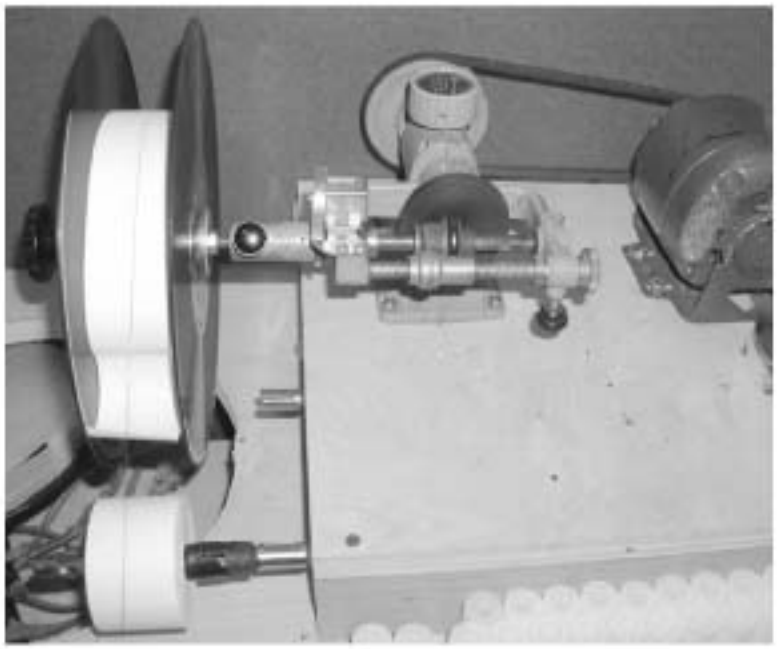




The bobbin shaft consists of a threaded rod, 5/16-18. On to this shaft a plastic bobbin is placed onto which the successive turns of wire and interleaves will be placed.

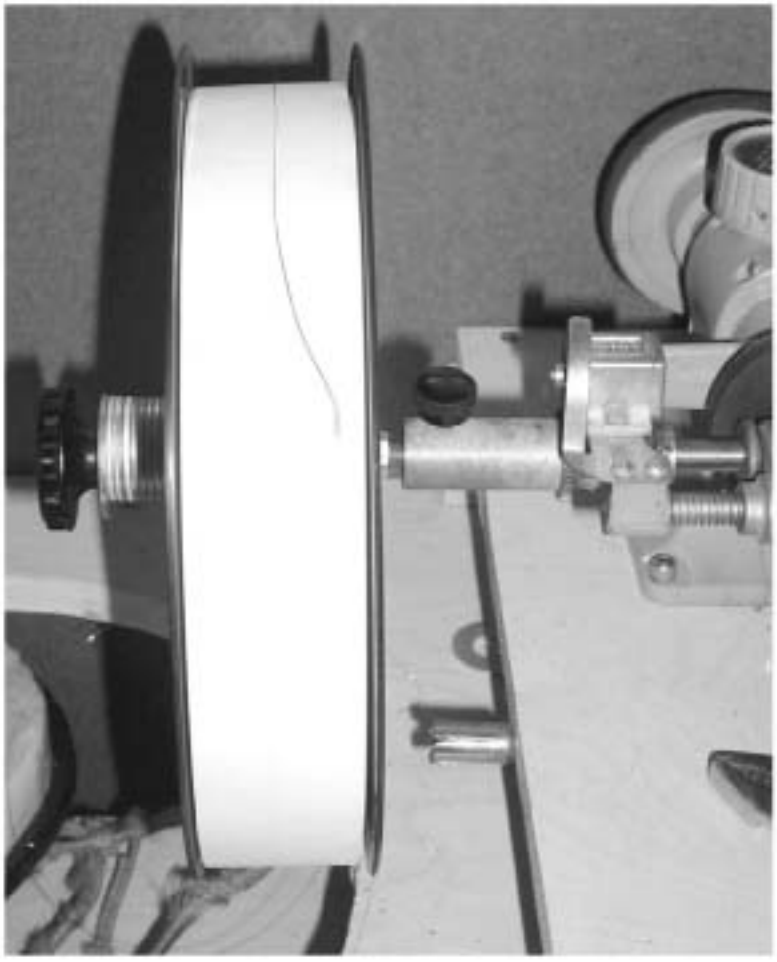
Two disks of hard plastic are used to keep the interleaves and windings in the same plane. The author finds that 78 RPM Records work quite well, and can be procured in 10" and 12" diameters. The center holes will need reamed out slightly to be 5/16" in diameter. These 'shellac' records are quite strong, and have properties similar to bakelite. It is important that the disks not be flexible, as this will interfere with the structure of the windings as successive layers are placed on the bobbin.

The actual wire to be wound should be in small quantities as needed (in 1 or 2 pound spools). These spools should be made to rotate freely on a shaft. Below is a photo of a simple arrangement.



Above one can see the winding in operation. Similar to the bobbin holder for the spool of wire is a separate spool of insulating material or interleave material. This material is used to separate the individual layers of the coil. For single-turn per layer Pancake Coils, this interleave is wound onto the bobbin at the same instance as the wire. As the interleave material will frequently run out during the coil winding process, the arrangement is made much simpler. This allows the operator to control the tension of the interleave spool more or less at will by tension from the operator's hand.

Above to the right one can see a Multilayer Disruptive Discharge Coil nearly completed in the coil winder. Below is the same coil with the coil and disks removed from the shaft.

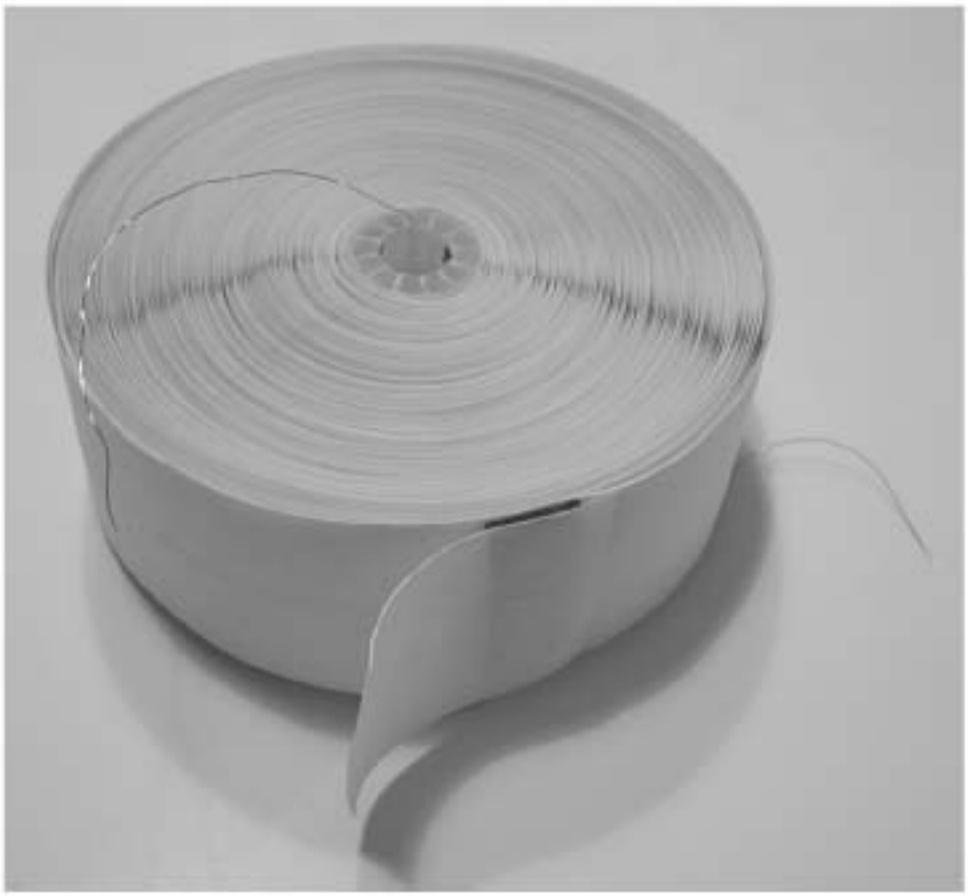


Multilayer Disruptive Discharge Coil, Impregnated with Wax

Multilayer Disruptive Discharge Coil, with Post and Primary Coil

Closeup of smaller Disruptive Discharge Coil

Side View of Impregnated Coil



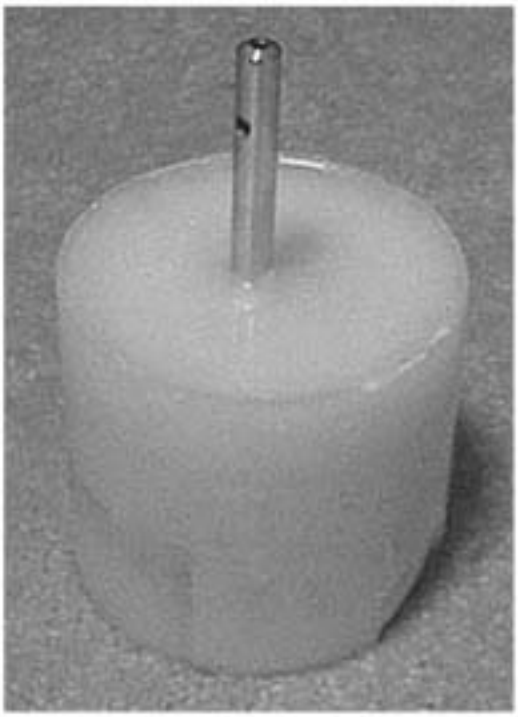
The author would like to define a few terms to avoid confusion in dealing with various types of Multilayer Disruptive Discharge Coils.

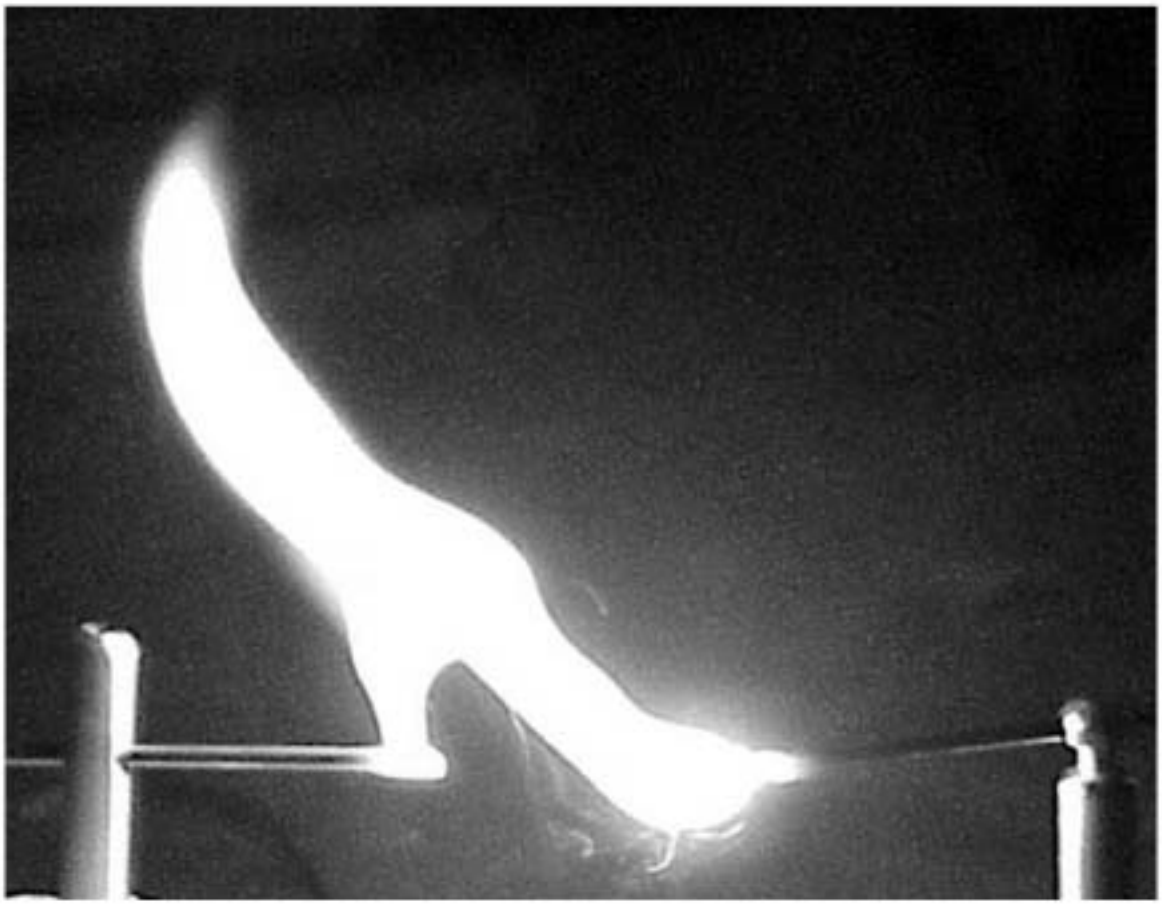
* Disruptive Discharge Coil - A Tesla Coil as defined by Tesla's patents and lectures in the 1890s. It can employ various designs, including Conical Secondary Coils, Flat Spiral Secondary Coils, Multilayer Secondary Coils, Helical Secondary Coils, or combinations of the above. The apparatus used to excite the coils employ the 'disruptive discharge' of a condenser through the primary coil of the 'Tesla Coil'. This can be accomplished with an induction coil and leyden jar, transformer / condenser / spark gap arrangement, self-induction coil and mechanical or mercury break, or from high frequency alternators / condensers.

* Flat Spiral Pancake Coil - A Multilayer Disruptive Discharge Coil that contains only one turn of wire per layer. The finished coil, Primary and Secondary, are wound in the same plane. For large coils, the primary coil may be tapped from the outermost turn of wire; for small coils, the primary coil may be separate and contained in the same plane, connected to the outermost turn of the secondary and/or electrically grounded. Examples of a 9" Coil can be seen on Pages 82 - 87. By adjusting the voltage and capacity of these coils powerful effluve and snakelike streamers can be acheived as on Pages 88 - 89.

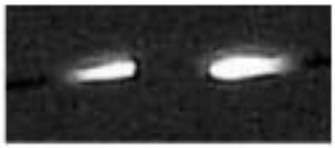
*Multi TPL Multilayer Disruptive Discharge Pancake Coil - A Multilayer Disruptive Discharge Coil that contains more than one turn of wire per layer. These coils are generally wound with less turns per layer in the centermost sections of the coil and more turns per layer on the outermost sections of the coil. Insulation of these coils is extremely difficult and laborious. This is required as each layer will be under extreme pressures. Coils wound in this fashion can yield extremely high voltages with very little input current, and are extremely efficient. The output can vary from showers of sparks larger than the diameter of the coil, to white arcs that reach several thousand degrees and destroy anything in their paths. Examples of these discharges can be seen on Pages 70 - 73 in the author's original Prototype apparatus, as well as on Pages 74 - 81 in the author's Prototype 4" X-Ray Coil.

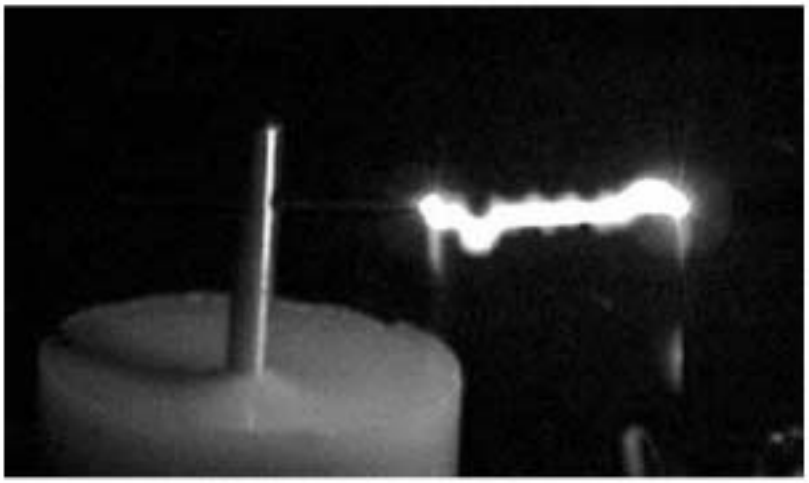
Tesla Multilayer Disruptive Discharge Coils...





...and Quenched Gap Apparatus





Tesla Multilayer Disruptive Discharge Coils...

...and Quenched Gap Apparatus

Tesla Multi-layer Disruptive Discharge Coils

The Turn Of The Century Electrotherapy Museum

http://www.electrotherapymuseum.com

Inside Diameter: **Outside Diameter:** **4"** **No. Of Prim. Turns:** **No. Of Sec. Turns: 372**

Insulation: Waxed Paper Dielectric Strength of Interleaves: 6000V Interleave Size: 2.5"

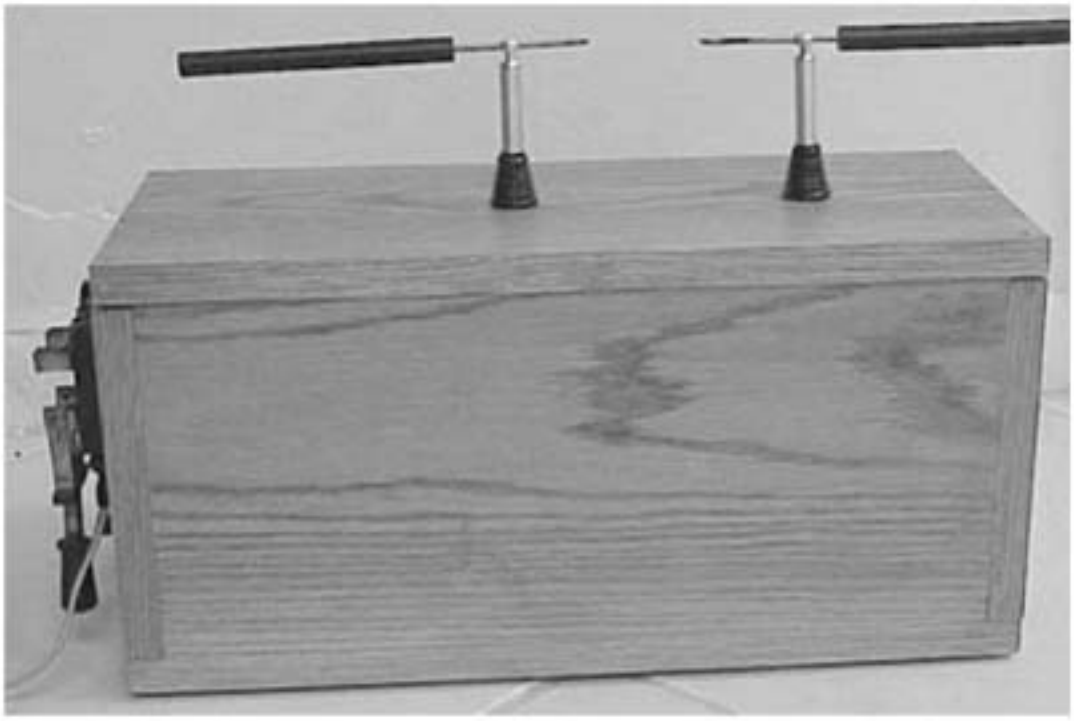
Voltage: _____

Turns Per Layer

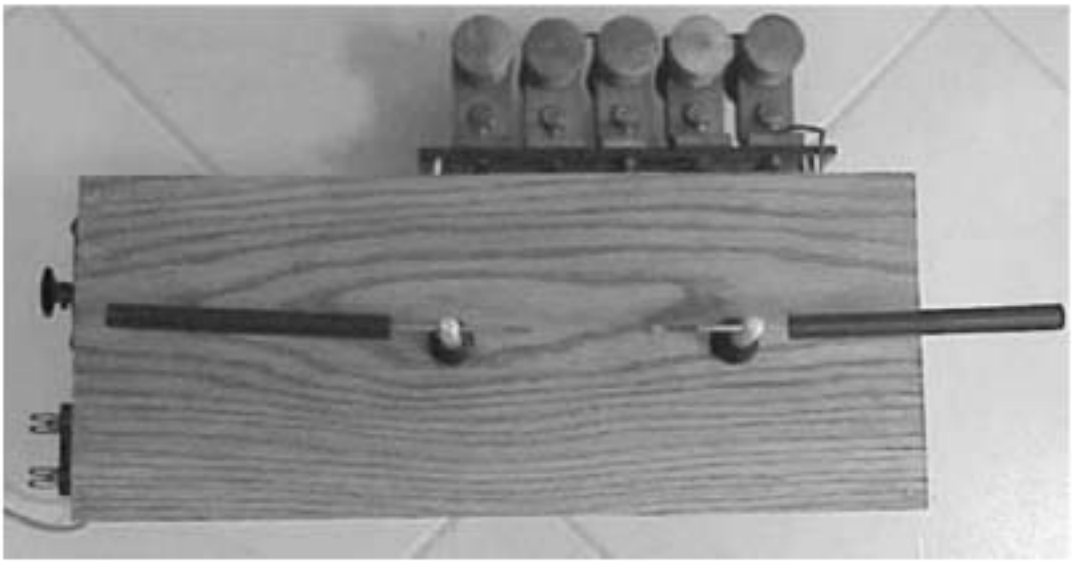
Layers	1	2	3	4	5	6	7	8	9	10	Time
1-10	4	5	6	7	7	8	9	9	10	10	
11-20	10	11	12	13	14	14	15	16	16	16	
21-30	16	16	16	16	16	16	16	16	16	16	
31-40											
41-50											
51-60											
61-70											
71-80											
81-90											
91-100											
101-110											
111-120											
121-130											
131-140											
141-150											

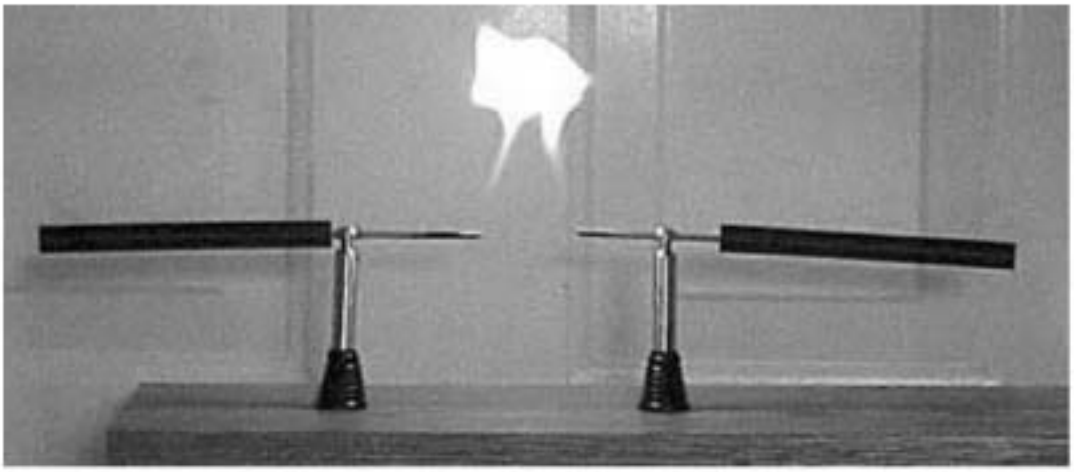
Tesla Multilayer Disruptive Discharge Coils...

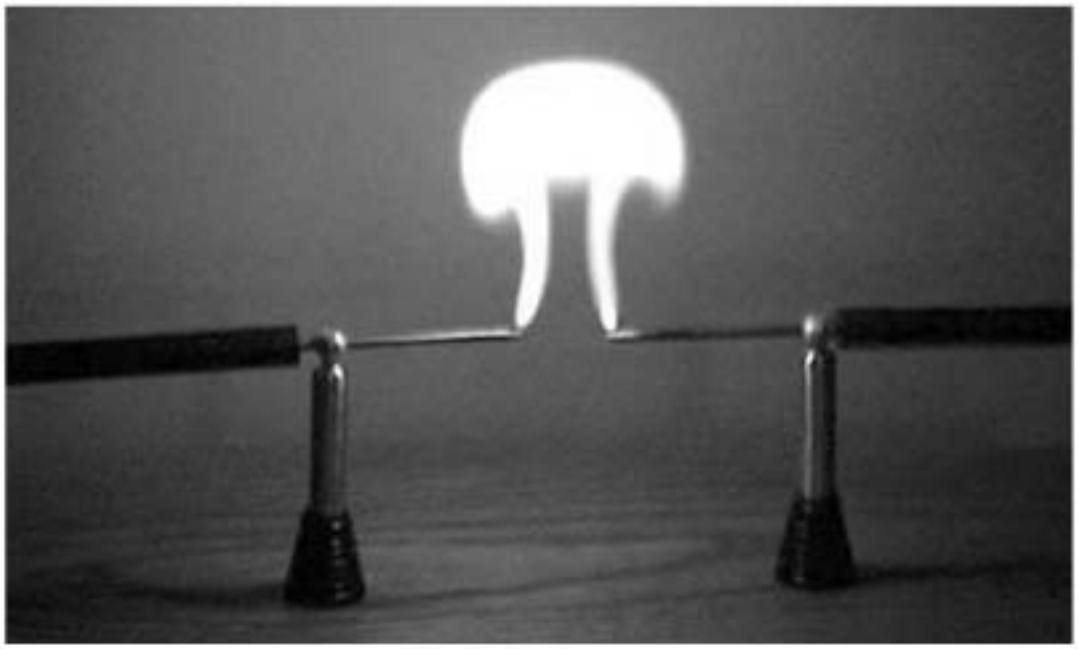
...and Quenched Gap Apparatus



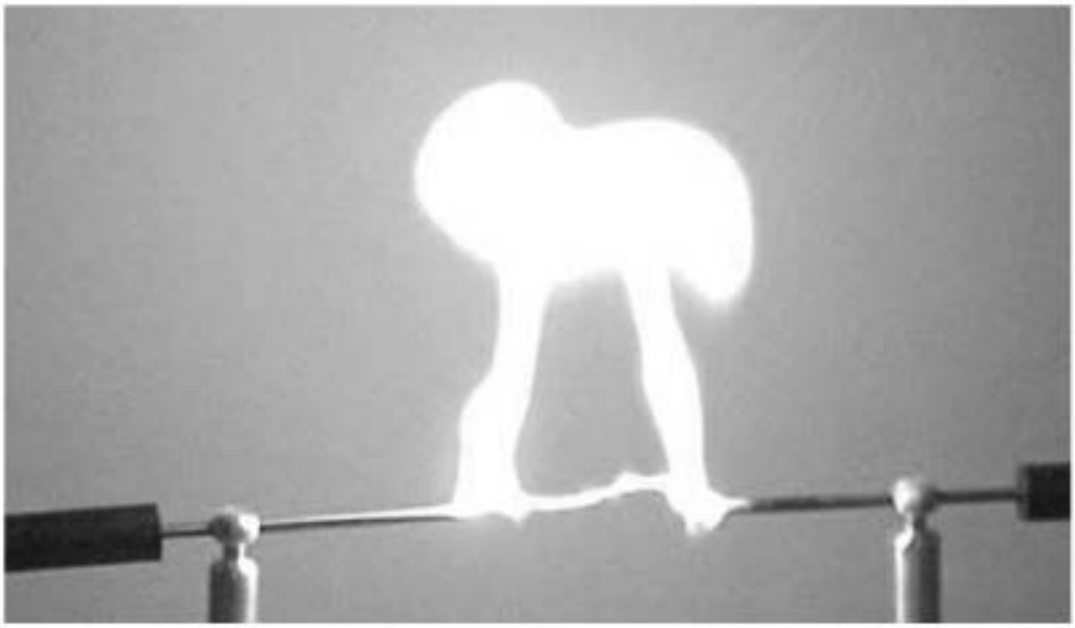
Tesla Multilayer Disruptive Discharge Coils...

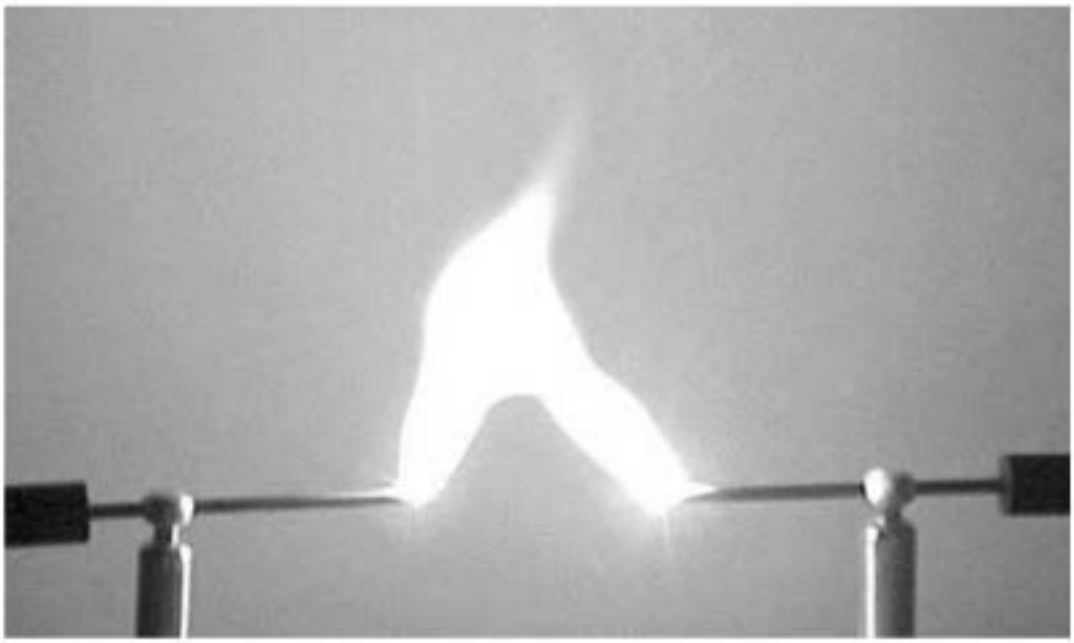


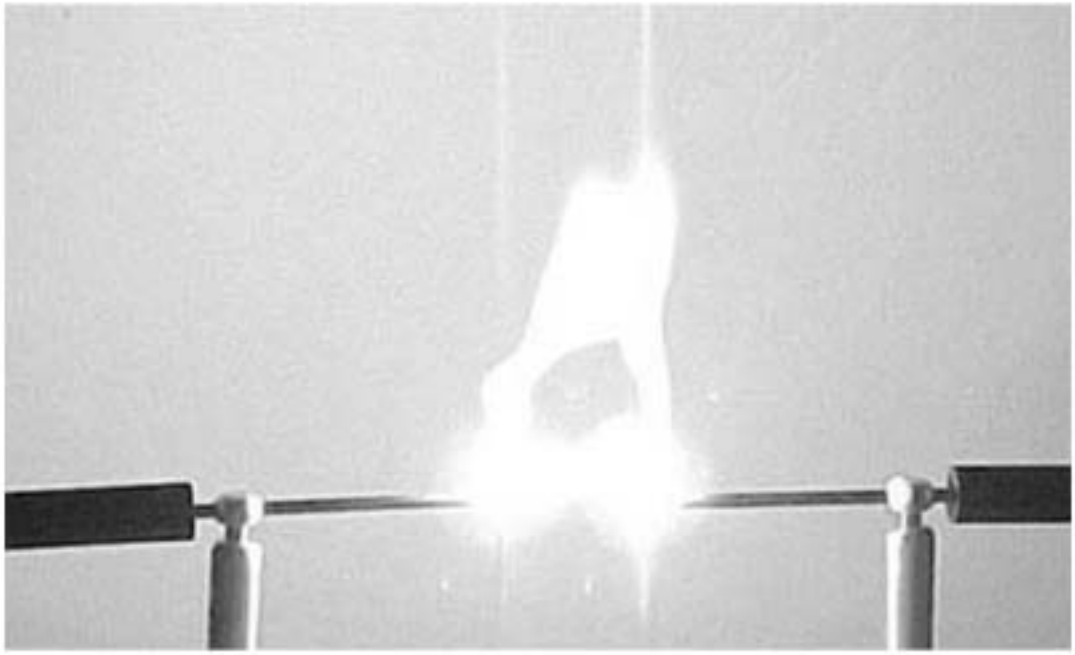


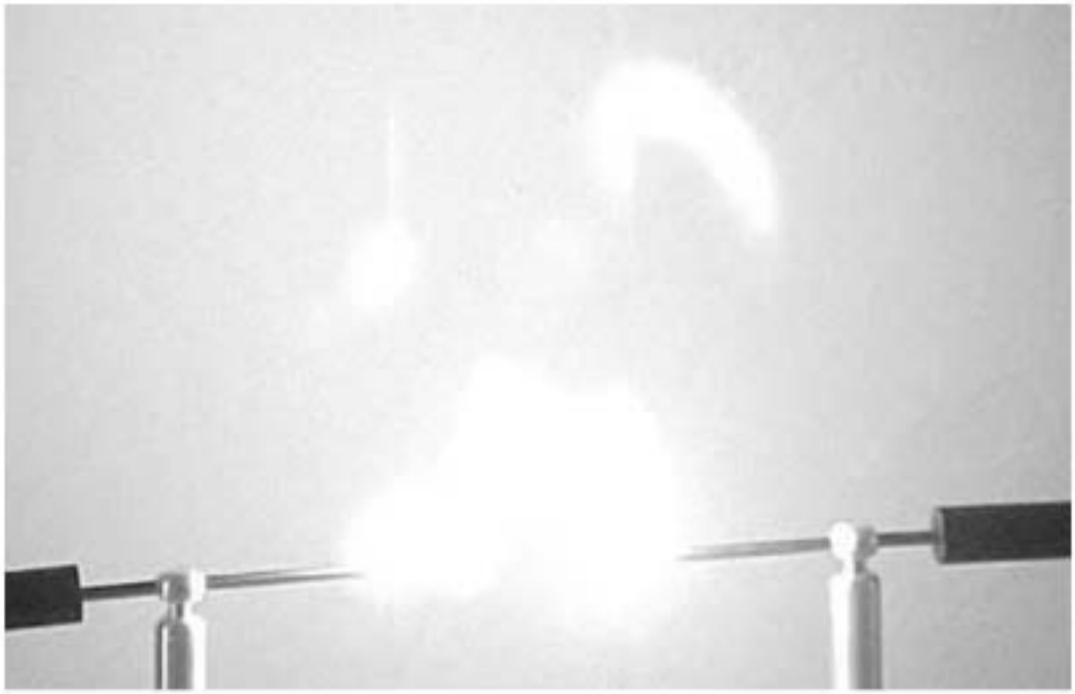


...and Quenched Gap Apparatus









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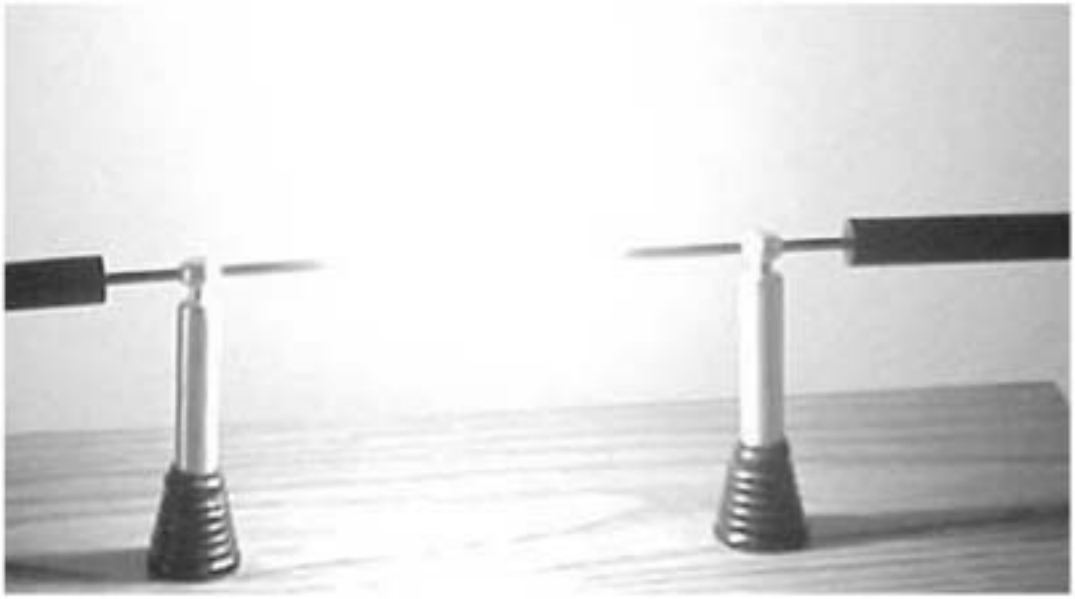
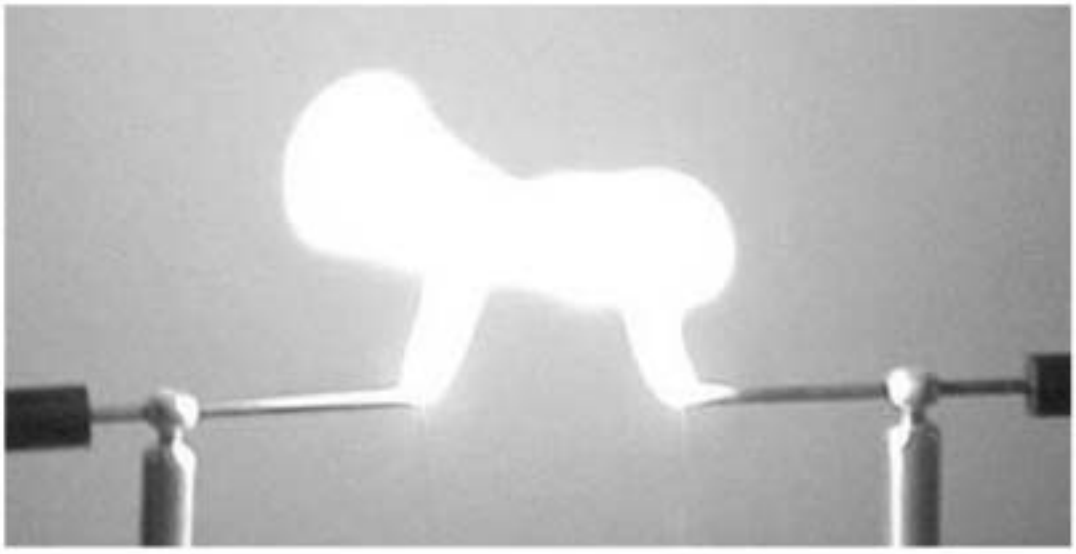
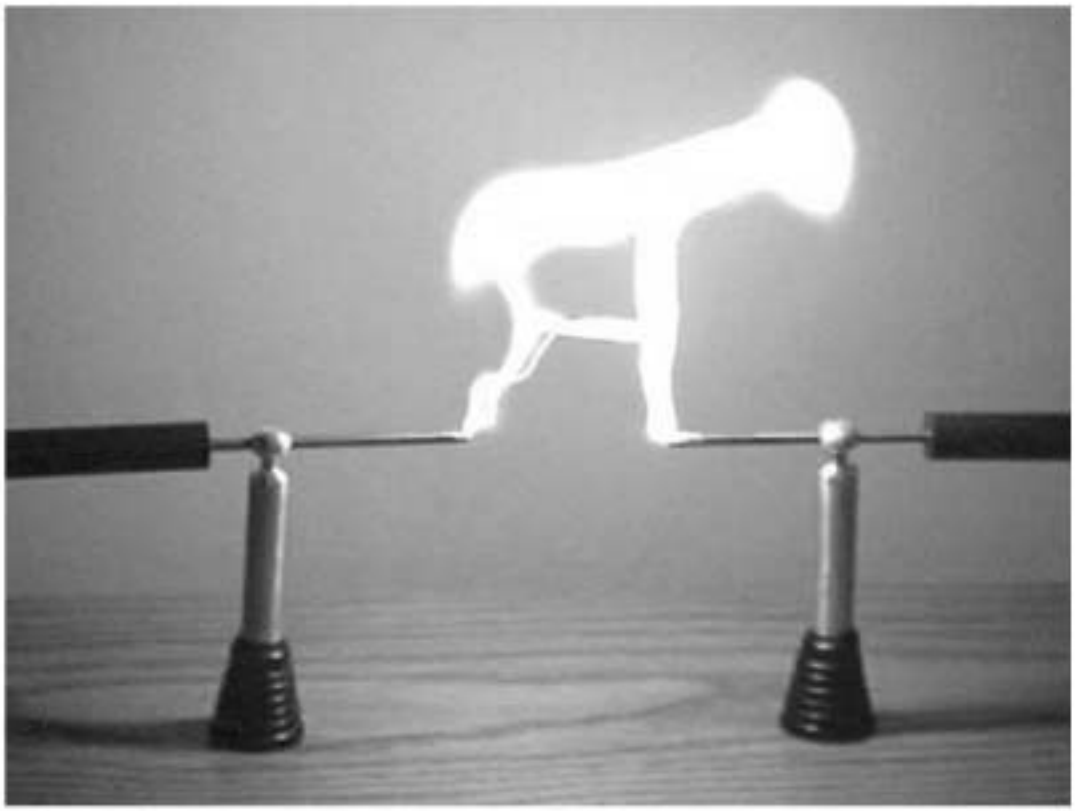
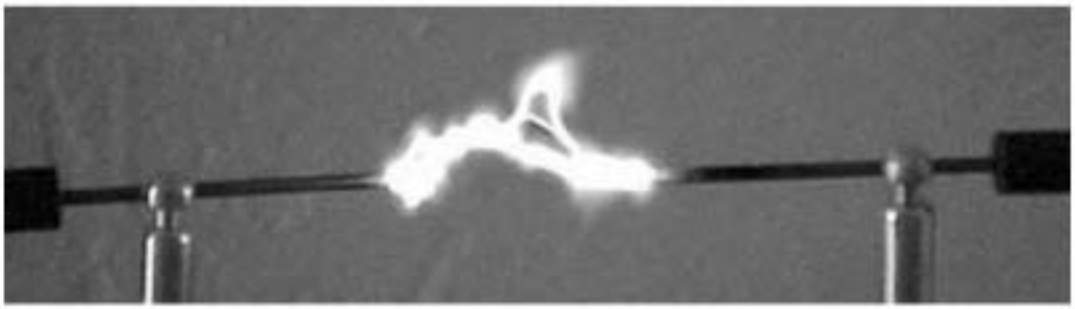
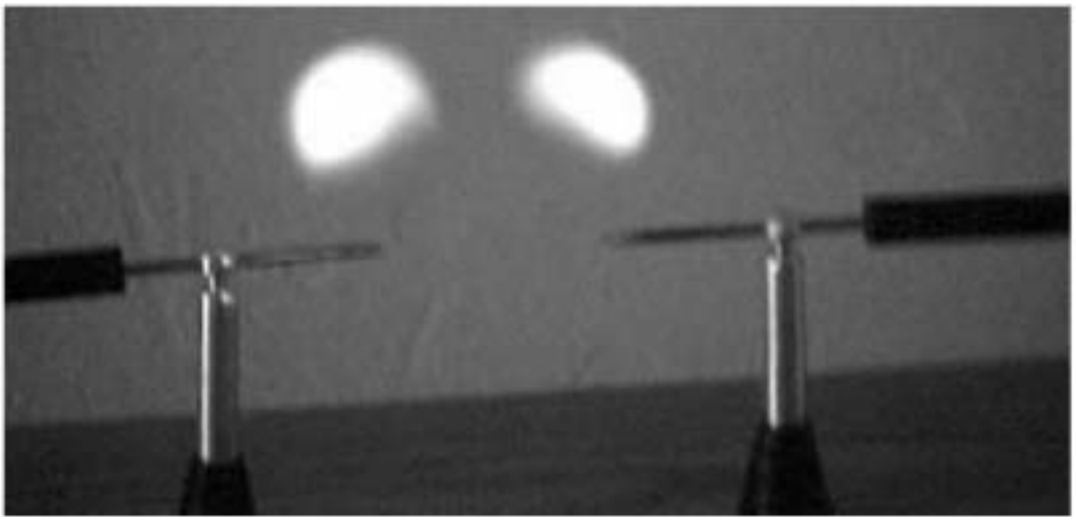




Tesla Multilayer Disruptive Discharge Coils...







...and Quenched Gap Apparatus

Tesla Multi-layer Disruptive Discharge Coils

The Turn Of The Century Electrotherapy Museum

http://www.electrotherapymuseum.com

Inside Diameter: **Outside Diameter: 3"** **No. Of Prim. Turns:** **No. Of Sec. Turns: 247**

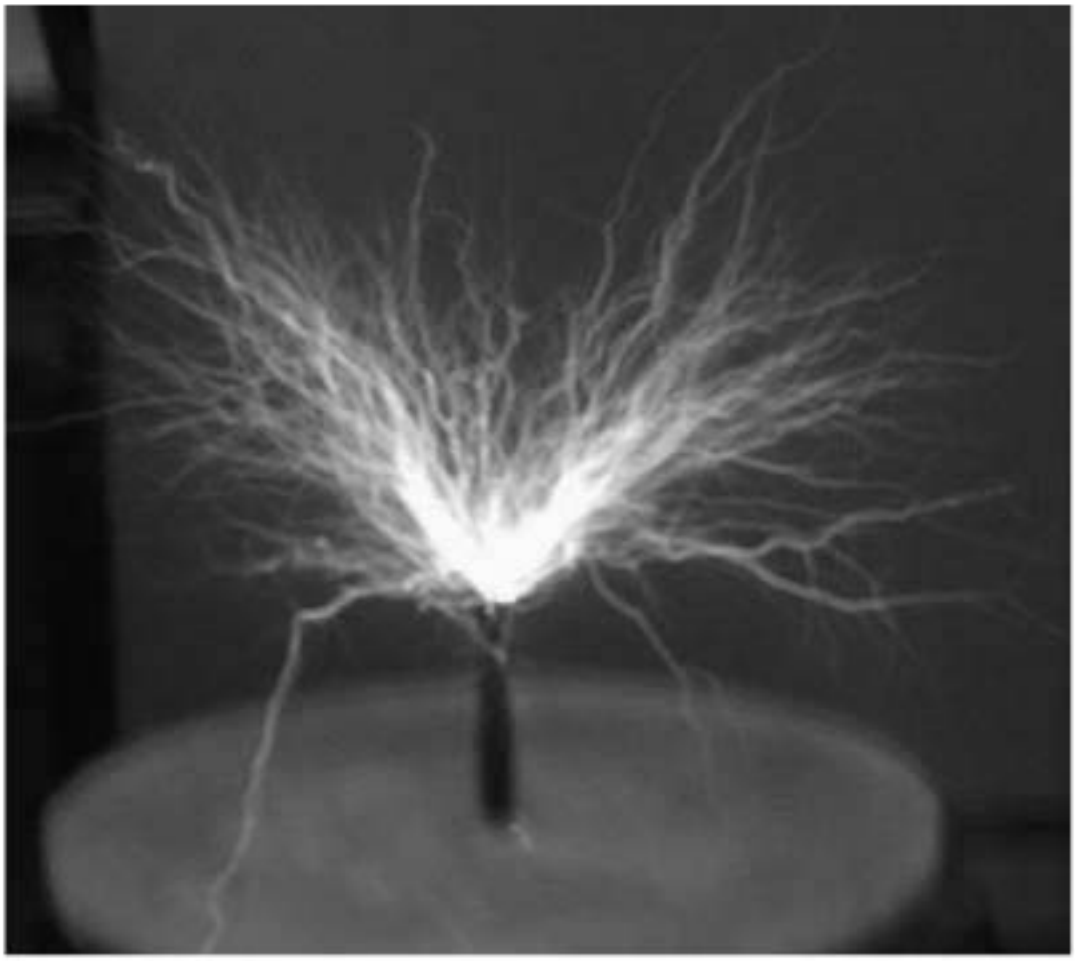
Insulation: Waxed Paper Dielectric Strength of Interleaves: 6000V Interleave Size: 2.5"

Voltage: _____

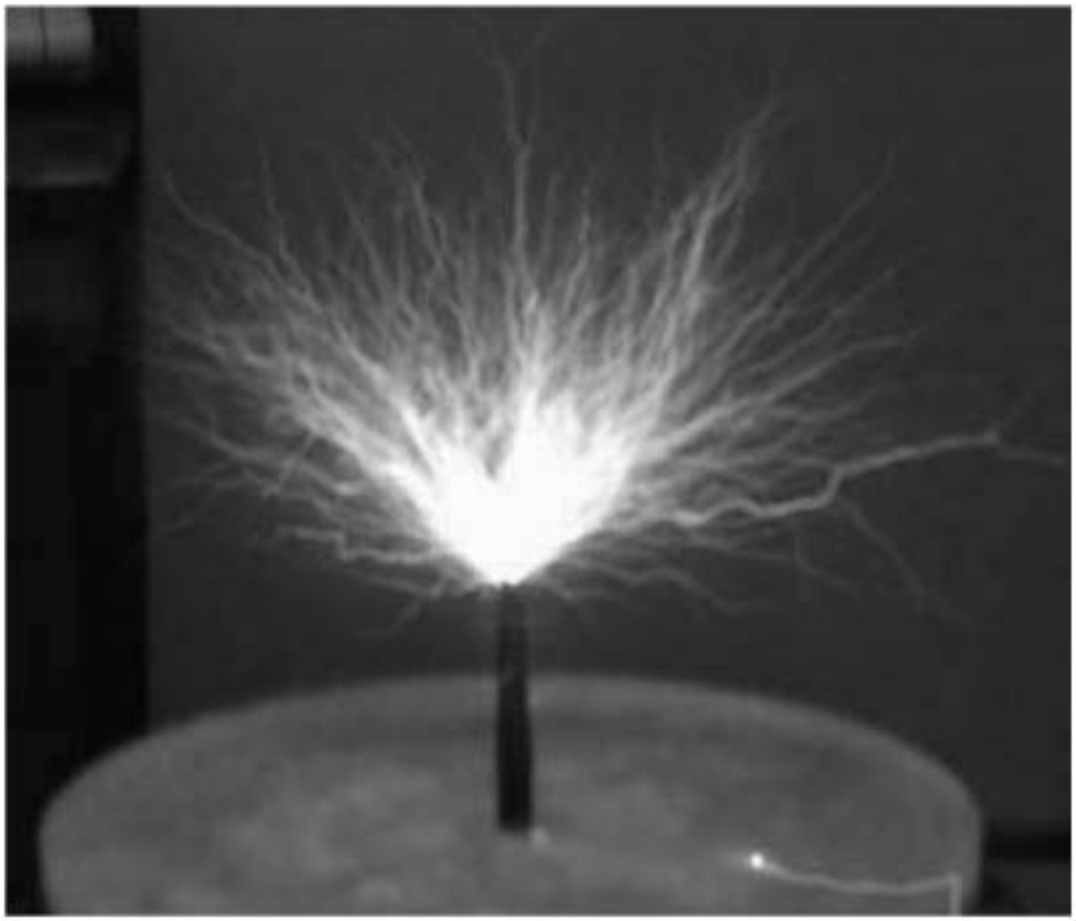
Turns Per Layer

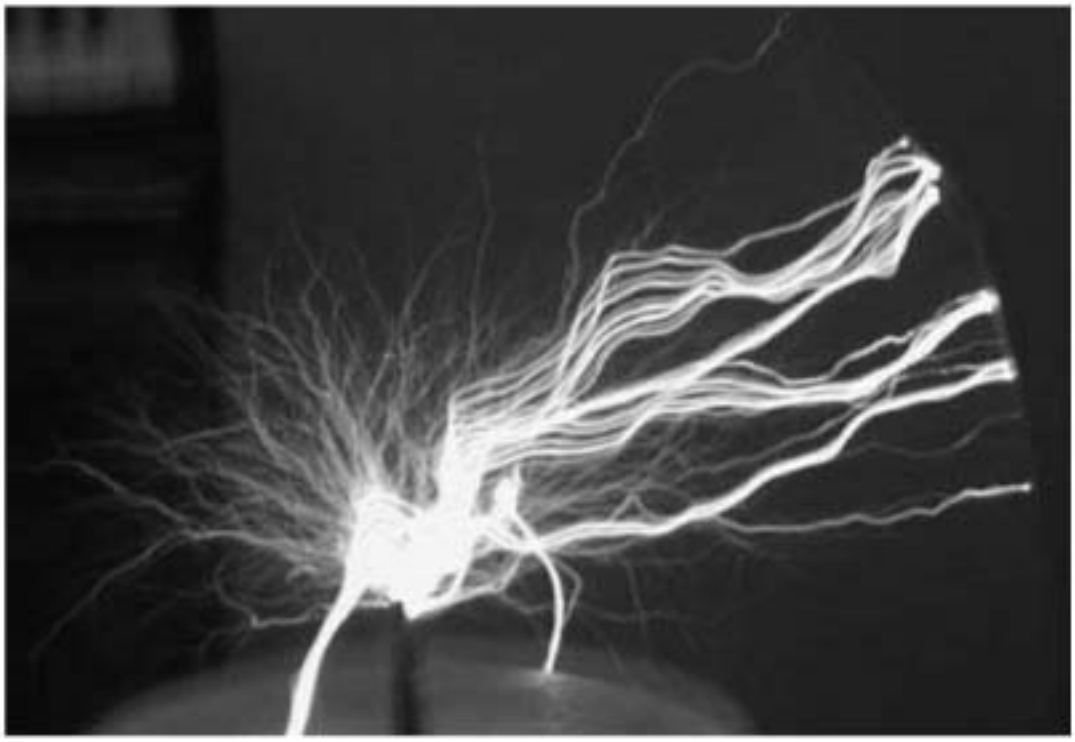
Layers	1	2	3	4	5	6	7	8	9	10	Time
1-10	4	5	6	8	9	10	11	12	14	14	2:56p
11-20	14	14	14	14	14	14	14	14	14	14	3:30p
21-30	14										
31-40											
41-50											
51-60											
61-70											
71-80											
81-90											
91-100											
101-110											
111-120											
121-130											
131-140											
141-150											

Tesla Multilayer Disruptive Discharge Coils...

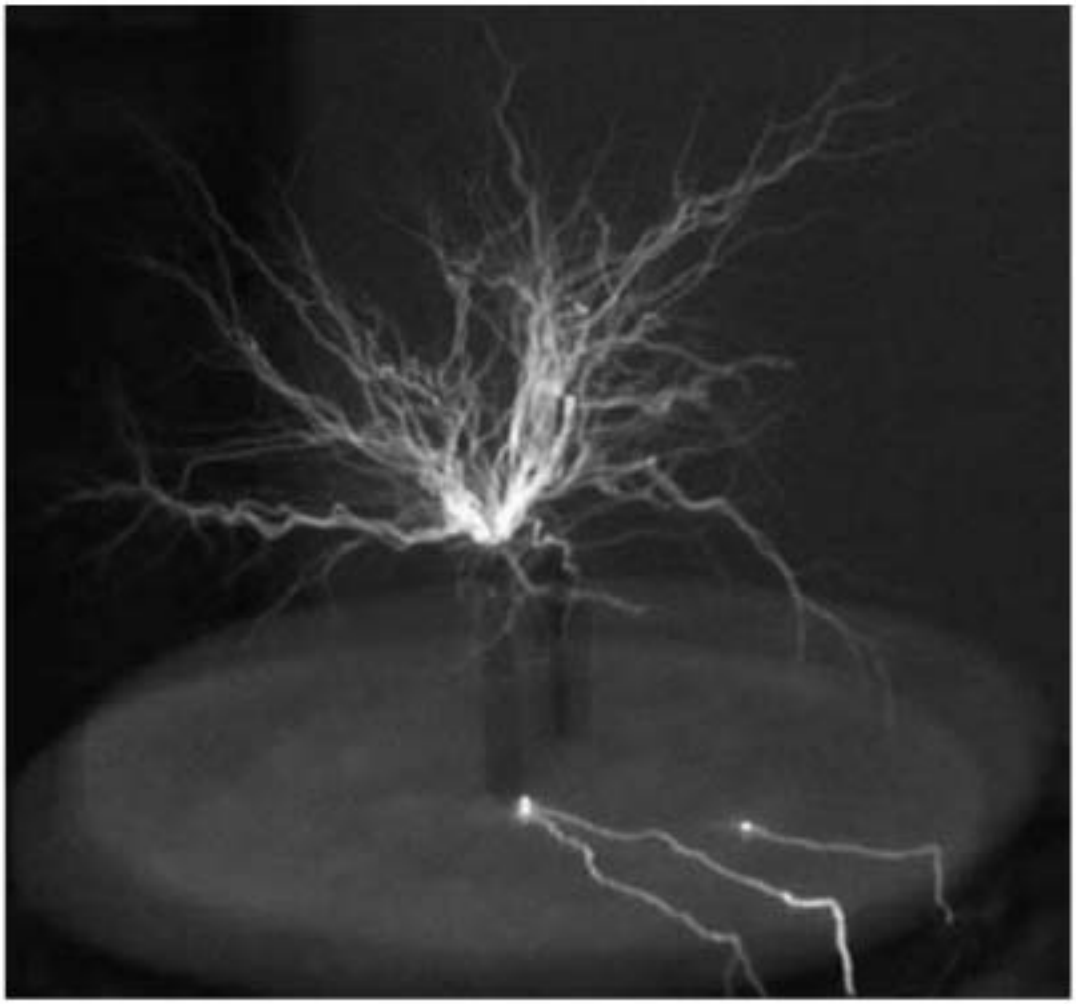


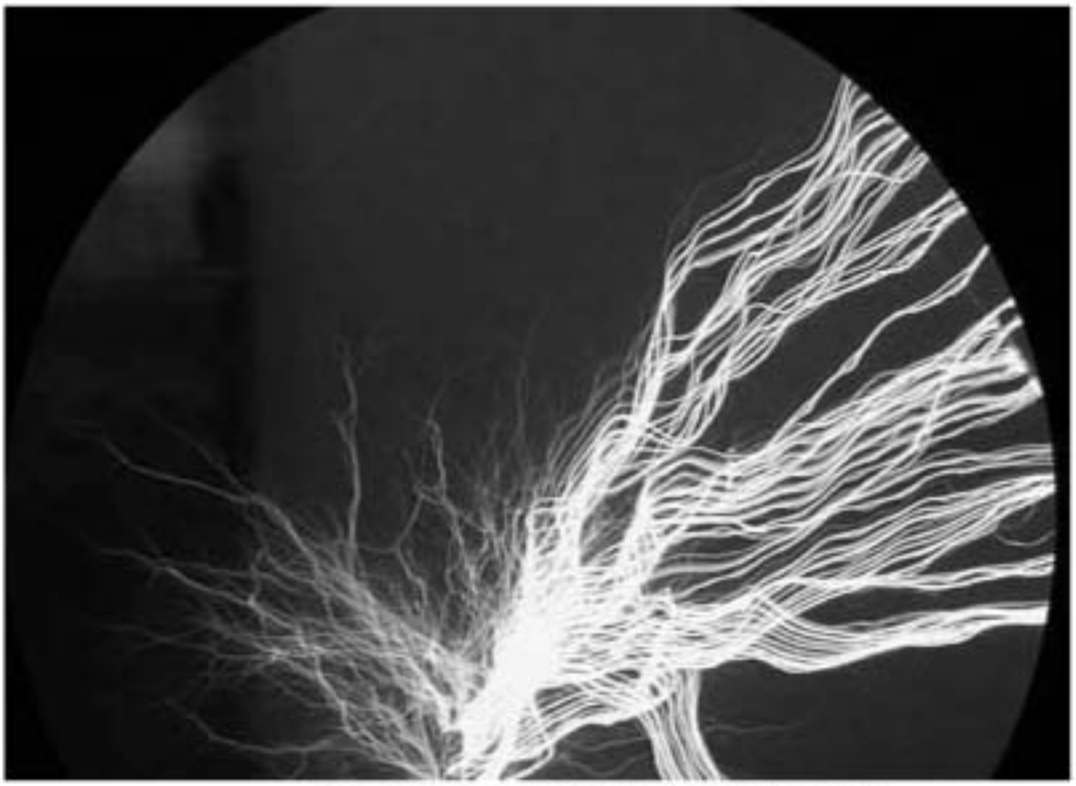
...and Quenched Gap Apparatus





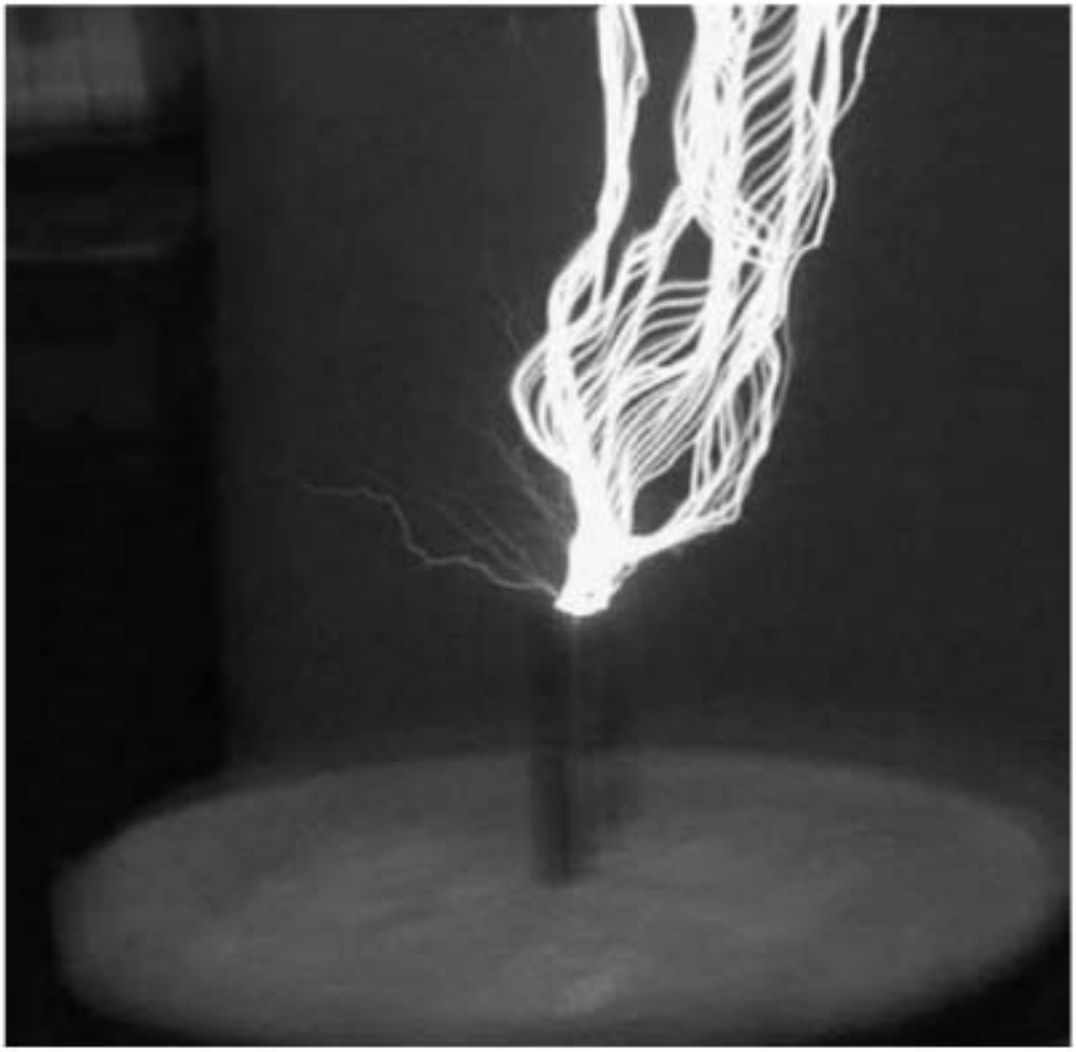
Tesla Multilayer Disruptive Discharge Coils...



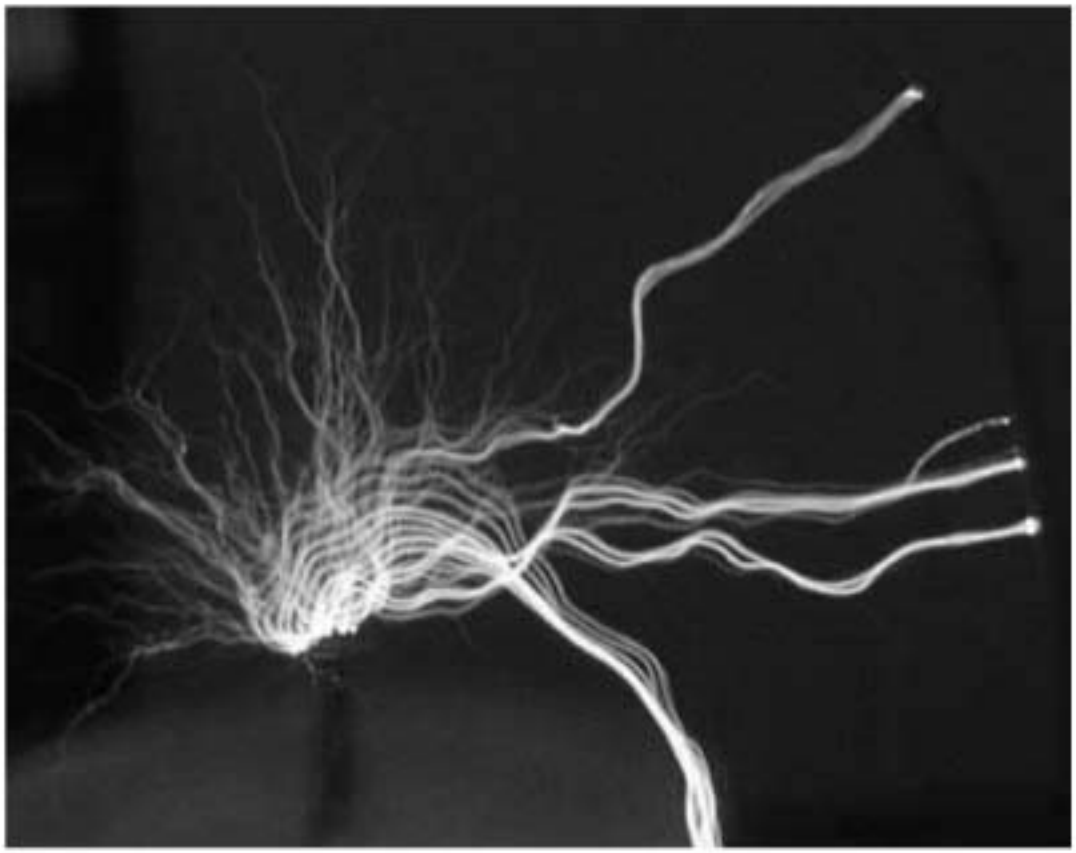


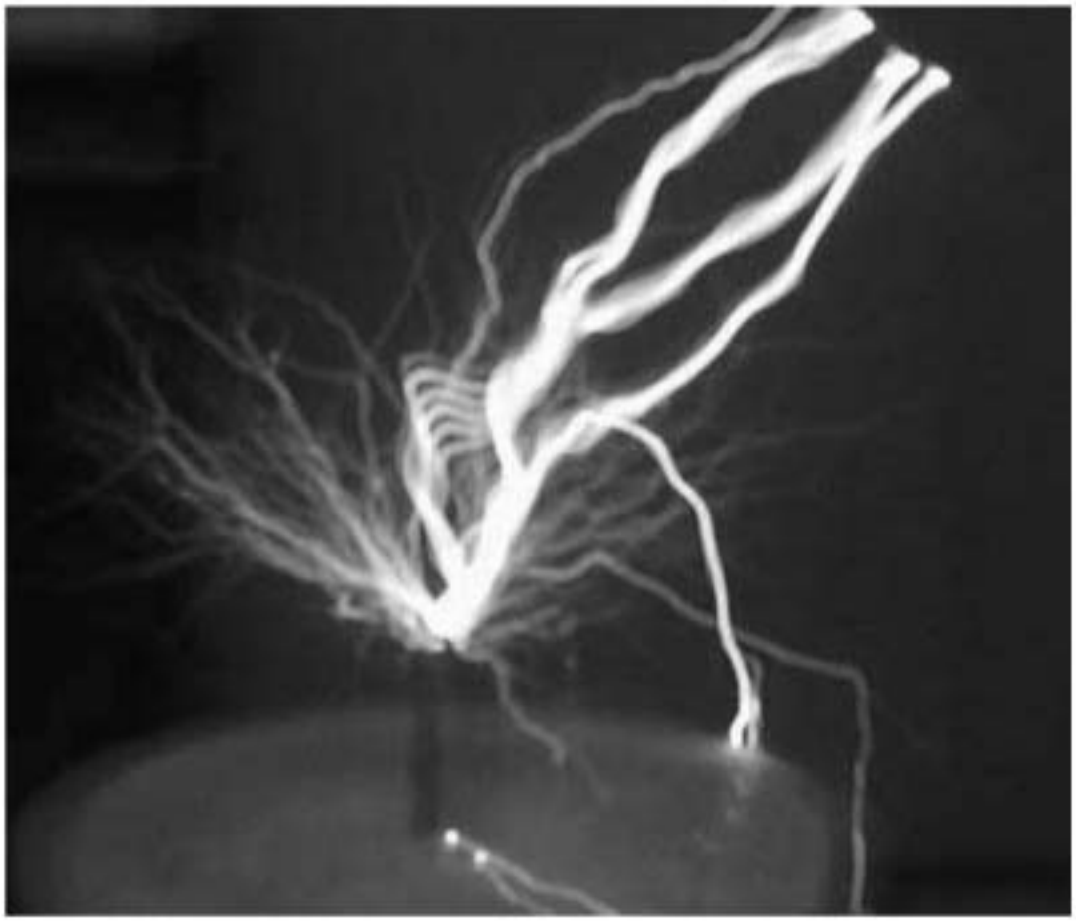
...and Quenched Gap Apparatus

Tesla Multilayer Disruptive Discharge Coils...

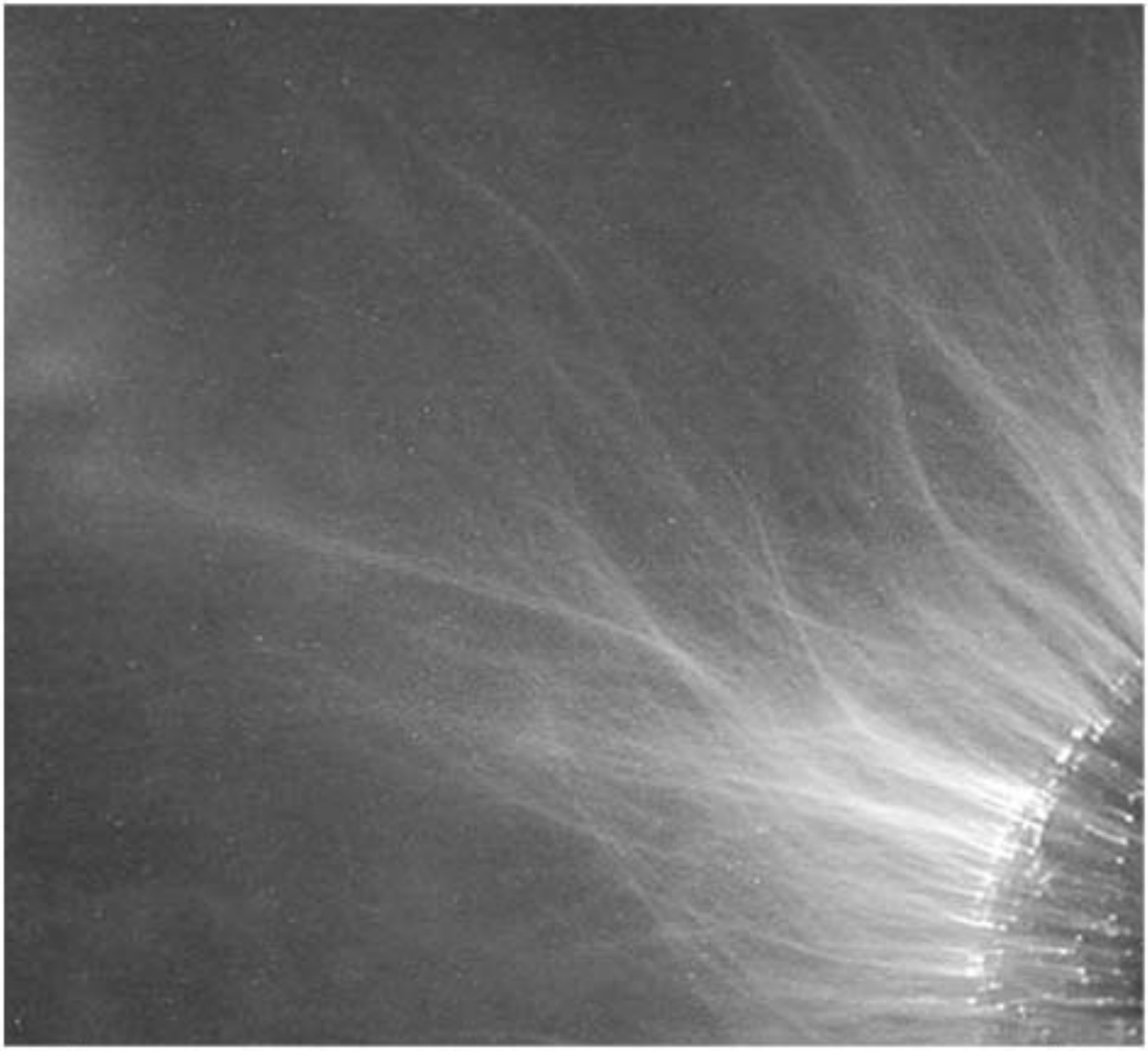


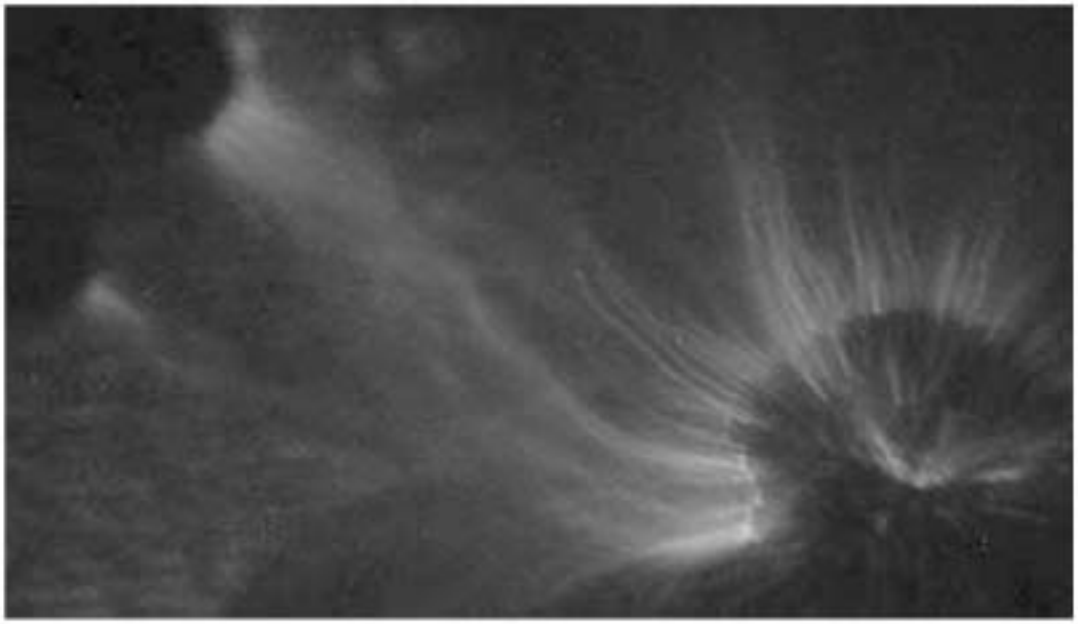
...and Quenched Gap Apparatus





Tesla Multilayer Disruptive Discharge Coils...





...and Quenched Gap Apparatus